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VOLUME 2

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Estimates Based on Order Statistics of Samples from Various Populations

by

H. LEON HARTER

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Interval estimation	Gamma population	Pareto population

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Chapter I of this volume will deal with point and interval estimation, from sample quasi-ranges, of the standard deviation of a normal population, and will include discussions of the method of computation of the necessary tables and of criteria for best interval estimators. The tables themselves will be given in Appendix A. A similar discussion of point and interval estimation, from the sample range (which provides efficient estimators), of the standard deviation of a rectangular population will be given in Chapter II and the related tables in Appendix B. Chapter III will deal with the (over)

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method of computation of expected values of order statistics from normal, exponential, Weibull, and Gamma populations and with their use in both testing and estimation. The related tables, together with a one-page table of moments of the last three of these populations, will be given in Appendix C. Chapter IV will deal with point estimation, from one or two order statistics, of one or two parameters of an exponential population and with interval estimation, from a single order statistic, of the parameter of a one-parameter exponential population. The criteria developed in Chapter I for best substitute interval estimators will be applied, and the method of computation of the necessary tables will be discussed. The tables themselves will be given in Appendix D. Chapter V will deal with conditional maximum-likelihood estimation, from the m available order statistics of singly censored samples, of certain parameters of populations related to the exponential. Both point and interval estimators will be given for the scale parameter of a Weibull population with known location and shape parameters, for the location parameter of a Type I extreme-value population with known scale parameter, for the scale parameters of Type II extreme-value populations with known shape parameters, and for the shape parameters of Pareto and limited populations with known location parameters. All of these estimators will be derived by transforming the known estimators for the parameter of a one-parameter exponential population. The computation of unbiasing factors, biases, variances of unbiased estimators, and efficiencies relative to the Cramér-Rao lower bound will be discussed. The tables themselves will be given in Appendix E. A similar treatment of the estimators of the same parameters from a single order statistic, again obtained by transformation of the known estimators for the parameter of a one-parameter exponential population, will be given in Chapter VI, which will also include a comparison of the one-order-statistic and m-order-statistic estimators. Chapter VII will deal with joint maximum-likelihood estimation, from doubly censored samples, of the parameters of normal, three-parameter lognormal, three-parameter Weibull, three-parameter Gamma, four-parameter generalized Gamma, logistic, and Type I extreme-value populations. In each case the likelihood function will be written down and its first and second derivatives with respect to the parameters will be worked out, an iterative procedure will be given for solution on an electronic computer of the likelihood equations obtained by equating the first derivatives to zero, and the information matrix, whose elements are the negatives of the limits, as the sample size tends to infinity, of the expected values of the second partial derivatives, will be inverted numerically to obtain the matrix of asymptotic variances and covariances. A discussion will be given of Monte Carlo studies conducted for several of these populations in order to check the applicability of the asymptotic theory to samples of small or moderate size and to compare the maximum-likelihood estimators with other estimators. Most of the chapter will be devoted to point estimation, but the final section will contain some remarks on interval estimation of the parameters of the above-mentioned populations. Tables of asymptotic variances and covariances of the maximum-likelihood estimators will be given in Appendix F, and tables summarizing the results of the Monte Carlo studies in Appendix G.

PREFACE

Following a suggestion by Dr. Paul R. Rider, whose sage advice and constant encouragement over a period of a dozen years of close daily association were most helpful, the author began in 1957 a study of the use of sample quasi-ranges in estimating the standard deviation of a normal population. While the computation of the efficient estimate based on the sample standard deviation does not seem too difficult to a statistician, it appeared that many users of statistics considered it so and therefore often resorted to subjective and quite inefficient methods of estimation. So it was evident that there was a need for an objective estimator which would be both reasonably efficient and simple to compute. Estimators based on quasi-ranges had been investigated by Mosteller and by Cadwell, and had been shown to have the desired properties, but up to that time they had been used relatively little, due mainly to the lack of suitable tables. The author therefore undertook the computation, for sample size $n \leq 100$, of the most efficient estimators based on one quasi-range and on linear combinations of two quasi-ranges. It was necessary first to compute tables of expected values, variances, and covariances of quasi-ranges. The author was able to tabulate the expected values to six decimal places on the Burroughs E101 computer, but found that machine inadequate to the task of tabulating the variances and covariances. The latter job was accomplished and the estimators and their efficiencies were calculated on the Univac Scientific (ERA 1103) computer with the programming assistance of Eugene H. Guthrie. The results were published in a 1958 Air Force technical report and in condensed form in a 1959 journal article. In addition, both versions contained results on the use of the sample range in obtaining the efficient estimator of the standard deviation of a rectangular population. The technical report also contained some results on the use of quasi-ranges in estimating the standard deviation of an exponential population, but these were omitted from the journal article because, as the author had become aware, quasi-ranges do not yield good estimators of the standard deviation of an asymmetric population. In fact, better estimators can be obtained from a single order statistic of a sample from a one-parameter exponential population or from a linear combination of two order statistics of a sample from a two-parameter exponential population. The author therefore turned his attention to estimators of the parameter, which is both mean and standard deviation, of a one-parameter exponential population from one or two order statistics and of both parameters of a two-parameter exponential population from two order statistics. The results, including tables computed by the author on the IBM 1620 computer with FORTRAN programming, were published in a 1961 journal article.

Meanwhile, the author had begun in 1960 an investigation of exact confidence bounds for the standard deviation of rectangular, one-parameter exponential, and normal populations, based respectively on the sample range, one order statistic, and a suitably chosen quasi-range. Approximate confidence bounds, obtained by the use of partially distribution-free methods, had already been tabulated by Leone, Rutenberg and Topp, but the author was convinced that increases in effectiveness large enough to warrant the greater computational effort could be obtained by tabulating the cumulative distribution functions of the statistics involved, interpolating inversely to find the required percentage points, and taking the reciprocals of the percentage points as coefficients of the statistics in the exact confidence bounds. The computations for the rectangular population were programmed by Eugene H. Guthrie for the Univac Scientific (ERA 1103A) computer, and the results were published in a 1961 Air Force technical report and in condensed form in a 1961 journal article. For the normal population some preliminary numerical analysis, most of which was performed by Edwin L. Godfrey, was required. Eugene H. Guthrie did most of the programming for the IBM 7090 computer. The results were published in a 1963 Air Force technical report and in condensed form in a 1964 journal article. In these publications the efficiency of an interval estimator was defined and a criterion based on maximizing the efficiency instead of the effectiveness was proposed; in the technical report the results obtained by use of the two criteria were compared. For the exponential population, the author wrote his own FORTRAN programs for the IBM 7090 and 7094 computers. The results based on the criterion of maximizing the effectiveness were published in 1963 in the *Rider Anniversary Volume* and those based on maximizing the efficiency in a 1964 journal article. By-products of these studies were new tables of the incomplete Gamma-function ratio and of percentage points of the chi-square and Beta distributions, which were published by the author in book form in 1964.

The author, with the assistance of Eugene H. Guthrie, who programmed the computations for the Univac Scientific (ERA 1103A) computer, tabulated the expected values of normal order statistics for all sample sizes n up through 100 and for selected values of n up through 400. The results were published in a 1960 Air Force technical report and in condensed form in a 1961 journal article. During the next two or three years, the author received several inquiries as to the availability of similar tables for samples from populations other than the normal. In order to satisfy a need for such tables, he undertook the computation of expected values of exponential, Weibull, and Gamma order statistics, this time writing his own FORTRAN programs for the IBM 7094 and 1620 computers. In the cases of the Weibull and Gamma order statistics, these were modifications of programs supplied by Captains Ronald J. Quayle and Robert C. Karns, respectively. The results were published in a 1964 Air Force technical report. The expected values of normal order statistics have applications to tests of hypotheses based on normal theory as well as to problems of estimation, so they could have been included in Volume 1, but for convenience they are included in this volume with those for samples from other populations.

Late in 1963 or early in 1964 the author began what has proved to be a very fruitful collaboration with Professor Albert H. Moore of the Air Force Institute of Technology on problems involving the estimation of parameters of life distributions by the use of order statistics. The ensuing investigation has followed two separate but related lines. The first of these involves the use of functional relationships between the one-parameter exponential population and other populations (Weibull, extreme-value, Pareto, and limited) to obtain estimators, based on one order statistic or on the first (or last) m order statistics of a sample of size $n(\geq m)$, of one parameter of the other population, assuming that its other parameter(s) is (are) known, by a transformation of the known results for the exponential population. Henry E. Fettis gave invaluable assistance in the evaluation of integrals and other mathematical manipulations. The second and more extensive line of investigation has been concerned with iterative maximum-likelihood estimation, from doubly censored samples, of the parameters of normal, three-parameter lognormal, three-parameter Weibull, three-parameter Gamma, logistic, Type I extreme-value, and four-parameter generalized Gamma populations. Professor Moore collaborated with the author in all but the last of these. In each case the likelihood function and its first and second partial derivatives with respect to the parameters were written down, the first partial derivatives were equated to zero to obtain the likelihood equations, and a FORTRAN program was written to solve the likelihood equations iteratively on the IBM 7094 computer. The information matrix, whose elements are the limits, as the sample size $n \to \infty$, of the negatives of the expected values of the second partial derivatives of the likelihood function with respect to the parameters, was inverted numerically on the IBM 7094 computer, by the use of a FORTRAN program, to obtain the asymptotic variances and covariances of the maximum-likelihood estimators, which were then *tabulated*. For several of the populations, Monte Carlo studies were conducted for samples of small to moderate size in order to obtain information concerning the rate of convergence of the variances and covariances to their asymptotic values, and to compare the mean square errors of the maximum-likelihood estimators with those of other estimators. The results have been published in several journal articles which have appeared since 1965 and in a 1966 Air Force technical report.

All of the above results, except those included in the author's 1964 book, have been collected in this volume, which contains essentially nothing new, though some of the results, especially the longer tables, have previously appeared only in Air Force technical reports, not in the open literature. Practically all of the tables in this volume are exactly as they appeared in previously published technical reports and journal articles, and some parts of the text have been lifted from the same sources with only minor revisions. Other parts of the text have been completely rewritten to provide a more unified treatment and to avoid unnecessary repetitions. Despite the paucity of new material, the author believes that a useful purpose will be served by assembling all these results, both theory and tables, in a single hardcover volume that will be more readily and permanently accessible than the separate sources.

References to related work by other authors, especially that performed after the author's own, have been purposely held to a minimum, both in Volume 1 and in the present volume. The author plans to remedy this deficiency in Volume 3, which will be devoted to a chronological annotated bibliography, with lists of references and citations.

The author wishes to express his appreciation to all the persons whose specific contributions have been acknowledged above, and to Miss Eva Brandenburg for typing the manuscript; also to Mr. Donald S. Clemm for ruling the tables and to TSgt. James R. Marshall for preparing the overlays and figures.

Wright-Patterson Air Force Base, Ohio
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INTRODUCTION

Consider a sample consisting of n observations drawn at random from some specified or unspecified population. If the sample values are arranged in order from the smallest, x_1, to the largest, x_n, so that $x_1 \leq x_2 \leq \ldots \leq x_n$, then x_1 is called the *first order statistic*, x_2 the *second order statistic*, . . ., and x_n the nth *order statistic* of the sample. The difference, $w = x_n - x_1$, between the nth (largest) and first (smallest) order statistics is called the sample *range*. The range of the $n - 2r$ observations remaining after the r largest and the r smallest have been discarded (censored), which is the difference, $w_r = x_{n-r} - x_{r+1}$, between the $(n-r)$th and $(r+1)$st order statistics, is called the rth *quasi-range* of the sample. Other functions of order statistics, such as the median, the midrange, the studentized range, and the studentized maximum modulus, are in common use, but they will not be defined here, since this volume will deal only with the range, the quasi-ranges, and the individual order statistics. More specifically, we shall deal with estimates of population parameters based on the range of samples from a rectangular population, quasi-ranges of samples from a normal population, and one or more order statistics of samples from various populations.

Every statistical population is characterized by one or more parameters whose values specify the population completely, once the form of the population is known. The familiar normal population has two parameters, the mean and the standard deviation, while the one-parameter negative exponential population has, as the name implies, just one parameter, which is both the mean and the standard deviation. A mathematical expression which estimates a population parameter as a function of a sample statistic is called an *estimator*, while a numerical value obtained from an estimator by substituting a numerical value for the sample statistic is called an *estimate*.

Distinction should be made at the outset between *point estimation* and *interval estimation*. In the former the result is a single value, while in the latter it is an interval with which is associated a specified level of confidence that the population parameter lies in this interval. It is desirable that a point estimator should be *unbiased;* that is, that its expected value should be equal to the true value of the parameter. It is also desirable that an unbiased point estimator should be *efficient;* that is, that its variance should be smaller than that of any other unbiased estimator. Minimum-variance unbiased estimators are sometimes spoken of as *conventional* estimators. In certain situations, however, it may be desirable to use *substitute* estimators, which at best are unbiased but inefficient and at worst may even be biased. The *efficiency* of an unbiased substitute estimator is defined as the ratio, expressed as a percentage, of the variance of the conventional estimator (if one exists) to that of the substitute estimator; the efficiency of a biased estimator is not defined. Interval estimators (confidence intervals) may be either *exact* or *approximate*, depending upon whether the level of confidence is exactly as specified or only approximately so; the requirement that interval estimators be exact is, in a certain sense, analogous to the requirement that point estimators be unbiased. The author has defined the *efficiency* of an interval estimator by a logical extension of the corresponding definition for a point estimator.

In a few cases estimators based on order statistics are the efficient estimators, but more often they are substitute estimators which sacrifice some efficiency in the interest of computational simplicity and/or robustness in the presence of outliers. In life testing, they are often used to obtain estimates of the parameters of the life distribution before all of the items placed on test have failed. Point estimators based on order statistics may be best linear unbiased estimators, based on all available observations from complete or censored samples or on one or more observations chosen in some optimal manner, or they may be maximum-likelihood estimators, based on censored samples, of a single parameter or of two or more parameters jointly. Interval estimators may be based on percentage points of order statistics or of functions of order statistics, or they may be based on maximum-likelihood estimators and their asymptotic variances and covariances.

Chapter I of this volume will deal with point and interval estimation, from sample quasi-ranges, of the standard deviation of a normal population, and will include discussions of the method of computation of the necessary tables and of criteria for best interval estimators. The tables themselves will be given in

Appendix A. A similar discussion of point and interval estimation, from the sample range (which provides efficient estimators), of the standard deviation of a rectangular population will be given in Chapter II and the related tables in Appendix B.

Chapter III will deal with the method of computation of expected values of order statistics from normal, exponential, Weibull, and Gamma populations and with their use in both testing and estimation. The related tables, together with a one-page table of moments of the last three of these populations, will be given in Appendix C.

Chapter IV will deal with point estimation, from one or two order statistics, of one or two parameters of an exponential population and with interval estimation, from a single order statistic, of the parameter of a one-parameter exponential population. The criteria developed in Chapter I for best substitute interval estimators will be applied, and the method of computation of the necessary tables will be discussed. The tables themselves will be given in Appendix D.

Chapter V will deal with conditional maximum-likelihood estimation, from the m available order statistics of singly censored samples, of certain parameters of populations related to the exponential. Both point and interval estimators will be given for the scale parameter of a Weibull population with known location and shape parameters, for the location parameter of a Type I extreme-value population with known scale parameter, for the scale parameters of Type II extreme-value populations with known shape parameters, and for the shape parameters of Pareto and limited populations with known location parameters. All of these estimators will be derived by transforming the known estimators for the parameter of a one-parameter exponential population. The computation of unbiasing factors, biases, variances of unbiased estimators, and efficiencies relative to the Cramér-Rao lower bound will be discussed. The tables themselves will be given in Appendix E. A similar treatment of the estimators of the same parameters from a single order statistic, again obtained by transformation of the known estimators for the parameter of a one-parameter exponential population, will be given in Chapter VI, which will also include a comparison of the one-order-statistic and m-order-statistic estimators.

Chapter VII will deal with joint maximum-likelihood estimation, from doubly censored samples, of the parameters of normal, three-parameter lognormal, three-parameter Weibull, three-parameter Gamma, four-parameter generalized Gamma, logistic, and Type I extreme-value populations. In each case the likelihood function will be written down and its first and second derivatives with respect to the parameters will be worked out, an iterative procedure will be given for solution on an electronic computer of the likelihood equations obtained by equating the first derivatives to zero, and the information matrix, whose elements are the negatives of the limits, as the sample size tends to infinity, of the expected values of the second partial derivatives, will be inverted numerically to obtain the matrix of asymptotic variances and covariances. A discussion will be given of Monte Carlo studies conducted for several of these populations in order to check the applicability of the asymptotic theory to samples of small or moderate size and to compare the maximum-likelihood estimators with other estimators. Most of the chapter will be devoted to point estimation, but the final section will contain some remarks on interval estimation of the parameters of the above-mentioned populations. Tables of asymptotic variances and covariances of the maximum-likelihood estimators will be given in Appendix F, and tables summarizing the results of the Monte Carlo studies in Appendix G.

Each chapter will be divided into two or more self-contained sections. Equations will be numbered consecutively within sections, the first equation in each section being designated Equation (1). A list of references will be given at the end of each section.

CHAPTER 1

QUASI-RANGES OF SAMPLES FROM A NORMAL POPULATION

1. POINT ESTIMATION OF THE POPULATION STANDARD DEVIATION σ*

1.1 INTRODUCTION

Both engineers and operations analysts often make use of statistical methods, but many of them seem to have an aversion to computing standard deviations. Attempts have been made to estimate the standard deviation σ of a population, assumed to be normal, by plotting the data on normal probability paper, drawing the best-fitting straight line "by eye", and estimating σ as the difference between the 84 percent point and the 50 percent point. This is a highly subjective procedure, and moreover one which is highly sensitive to departures from normality, so it is not surprising that it often gives quite inaccurate results. It is well known that, for small samples, the population standard deviation can be estimated quite efficiently from the sample range. However, the efficiency of the estimator based on the range decreases rather rapidly as the sample size increases, being less than 35 percent for samples of 100. There appears to be a need for substitute estimators which are reasonably efficient for moderate sample sizes, yet much simpler to compute than the efficient estimator based on the sample standard deviation. This chapter will be concerned with estimators based on sample quasi-ranges, which satisfy these requirements quite well. Such estimators were proposed by Mosteller (1946), but for a dozen years thereafter they were used relatively little, due mainly to the lack of suitable tables.

The rth quasi-range, w_r, of a sample of size n is defined as the range of $(n-2r)$ sample values, omitting the r largest and the r smallest. Symbolically,

$$w_r = x_{n-r} - x_{r+1}, \tag{1}$$

where $x_1 \leq x_2 \leq \ldots \leq x_n$ are the ordered sample values. Cadwell (1953) has shown that the range, w_0, is the most efficient statistic of this type for sample sizes up through $n=17$, beyond which point w_1 is optimum up through $n=31$, where w_2 becomes better. Cadwell (1953) has also proposed the use of linear combinations of quasi-ranges.

This section will deal with the most efficient unbiased estimators of the standard deviation of a normal population, based on one sample quasi-range and on linear combinations of two sample quasi-ranges.

1.2. METHOD OF COMPUTATION OF AUXILIARY TABLES

1.2.1. EXPECTED VALUES OF QUASI-RANGES

In order to determine the factor by which the rth quasi-range, w_r, must be multiplied in order to obtain an unbiased estimator of the population standard deviation, it is necessary to know the expected value of the rth quasi-range for samples of n from a standard normal population, which is given by the equation [see Cadwell (1953), p. 606]

$$E(w_r) = 2(r+1)\binom{n}{r+1}\int_{-\infty}^{\infty} x\left[\frac{1}{2}-\Phi(x)\right]^r\left[\frac{1}{2}+\Phi(x)\right]^{n-r-1}\phi(x)\,dx, \tag{2}$$

where $\phi(x) = (1/\sqrt{2\pi})\exp(-x^2/2)$ and $\Phi(x) = \int_0^x \phi(x)\,dx$. Expected values of the range (to five decimal places) have been tabulated for $n = 2(1)1000$ by Tippett (1925). Cadwell (1953) has tabulated $E(w_1)$ to four

*Earlier versions of this material were published by Harter (1958, 1959).

decimal places for $n = 10(1)30$. The author has computed tables of $E(w_r)$, accurate to within a unit in the sixth decimal place, for $r = 0(1)8$ and $n = (2r+2)(1)100$, using the Burroughs E101 computer. The trapezoidal rule was employed for the numerical integration. The results are given in Table A1.

1.2.2. VARIANCES OF QUASI-RANGES

In order to determine the variance of unbiased estimators based on quasi-ranges (and hence their efficiency), it is necessary to know the variance of the rth quasi-range for samples of n from a standard normal population, which is given by the equation

$$\text{var } w_r = E(w_r^2) - [E(w_r)]^2, \tag{3}$$

where [see Cadwell (1953), p. 604 for the probability density function]

$$E(w_r^2) = \frac{n!}{(n-2r-2)!(r!)^2} \int_{-\infty}^{\infty} \left\{ \int_0^{\infty} F(x, w_r) dw_r \right\} \left[\frac{1}{2} + \Phi(x) \right]^r \phi(x) dx, \tag{4}$$

in which

$$F(x, w_r) = w_r^2 [\tfrac{1}{2} - \Phi(x + w_r)]^r [\Phi(x + w_r) - \Phi(x)]^{n-2r-2} \phi(x + w_r). \tag{5}$$

Tippett (1925) and others have computed approximate values of the variance of the range for a few values of n. Cadwell (1953) has tabulated var w_1 to four decimal places for $n = 10(1)30$. The author, with the assistance of Eugene H. Guthrie, has computed tables of var w_r, accurate to within a unit in the fifth decimal place, for $r = 0(1)8$ and $n = (2r+2)(1)100$, using the Univac Scientific (ERA 1103) computer. A seven-point integration formula was used for a few cases where the trapezoidal rule did not give sufficient accuracy. The results are given in Table A2. Table A3 gives values of the standard deviation of the rth quasi-range, accurate to within 2 units in the fifth decimal place, for the same values of r and n.

1.2.3. COVARIANCES OF QUASI-RANGES

In order to determine the variance of unbiased estimators based on linear combinations of two quasi-ranges (and hence their efficiency), it is necessary to know not only the variances of the two quasi-ranges but also their covariance. The covariance of the rth and r'th quasi-ranges for samples of n from a standard normal population is given by the equation

$$\text{cov } (w_r, w_{r'}) = E(w_r w_{r'}) - E(w_r) E(w_{r'}) \tag{6}$$

in which

$$E(w_r w_{r'}) = 2[E(x_{r+1} x_{r'+1}) - E(x_{r+1} x_{n-r'})], \tag{7}$$

where the expected value of the product of the kth and k'th order statistics [see Wilks (1948), p. 20 for their joint probability density function] is given by the equation

$$E(x_k x_{k'}) = \frac{n!}{(k-1)!(k'-k-1)!(n-k)!} \int_{-\infty}^{\infty} \left\{ \int_{x_k}^{\infty} G(x_k, x_{k'}) dx_{k'} \right\} H(x_k) dx_k. \tag{8}$$

in which

$$G(x_k, x_{k'}) = x_{k'} [\Phi(x_{k'}) - \Phi(x_k)]^{k'-k-1} [\tfrac{1}{2} - \Phi(x_{k'})]^{n-k'} \phi(x_{k'}), \tag{9}$$

and

$$H(x_k) = x_k [\tfrac{1}{2} + \Phi(x_k)]^{k-1} \phi(x_k). \tag{10}$$

Godwin (1949) has tabulated (to five decimal places) the covariances of all order statistics for samples of $n = 2(1)10$. Teichroew (1956) has computed more extensive and more precise tables, accurate to ten decimal places, for $n = 2(1)20$. The author, again with the assistance of Eugene H. Guthrie, undertook the task of computing cov $(w_r, w_{r'})$ for $0 \leq r < r' \leq 8$ and $n = (2r' + 2)(1)100$, accurate to within a unit in the fifth decimal place, using the Univac Scientific (ERA 1103) computer, with a seven-point integration formula. Finding that the complete tabulation required too much machine time, he decided to limit the computations to those values required to determine the most efficient estimators of population standard deviation based on two adjacent quasi-ranges and on any two quasi-ranges $(r < r' \leq 8)$ for $n = 4(1)100$, together with the numerical values of the efficiency of these estimators.

1.3. UNBIASED ESTIMATORS OF σ

1.3.1. THE ESTIMATORS THEMSELVES

The efficient unbiased estimator of population standard deviation σ is the one based on the sample standard deviation s, and given by the equation

$$\hat{\sigma} = s/c_2, \tag{11}$$

where

$$s = [\Sigma\ (x - \bar{x})^2/(n-1)\ ]^{1/2} \tag{12}$$

and

$$c_2 = [2/(n-1)\ ]^{1/2}\, \Gamma\left(\frac{n}{2}\right) \Big/ \Gamma\left(\frac{n-1}{2}\right). \tag{13}$$

The unbiased estimator of σ based on one sample quasi-range is given by the equation

$$\tilde{\sigma}_r = w_r/E(w_r), \tag{14}$$

while the unbiased estimator of σ based on a linear combination of two sample quasi-ranges is given by the equation

$$\tilde{\sigma}_{r,r'} = \frac{w_r + \lambda_{r,r'} w_{r'}}{E(w_r) + \lambda_{r,r'} E(w_{r'})} \tag{15}$$

where $\lambda_{r,r'}$, is a weighting factor. In Equations (14) and (15), the expected values are understood to be those for samples drawn from N(0, 1), the standard normal population.

1.3.2. VARIANCES OF THE ESTIMATORS

The variance of the efficient estimator $\hat{\sigma}$ of population standard deviation σ is given by the equation

$$\text{var}\ \hat{\sigma} = \frac{\text{var}\ s}{c_2^2} = \frac{E(s^2) - [E(s)]^2}{c_2^2} = \frac{\sigma^2 - (c_2\sigma)^2}{c_2^2} = \frac{1 - c_2^2}{c_2^2}\,\sigma^2. \tag{16}$$

The variance of the estimator $\tilde{\sigma}_r$ based on one quasi-range is given by the equation

$$\text{var}\ \tilde{\sigma}_r = \frac{\text{var}\ w_r}{[E(w_r)]^2}, \tag{17}$$

while the variance of the estimator $\tilde{\sigma}_{r,r'}$ based on a linear combination of two quasi-ranges is given by the equation

$$\text{var}\ \tilde{\sigma}_{r,r'} = \frac{\text{var}\ w_r + 2\lambda_{r,r'}\ \text{cov}\ (w_r, w_{r'}) + \lambda^2_{r,r'}\ \text{var}\ w_{r'}}{[E(w_r) + \lambda_{r,r'} E(w_{r'})]^2}. \tag{18}$$

1.3.3. EFFICIENCIES OF THE ESTIMATORS

The efficiency of the efficient estimator $\hat{\sigma}$ is by definition 1 (100 percent). The efficiency of a substitute estimator is defined as the ratio of the variance of the efficient estimator to the variance of the substitute estimator. Thus the efficiency of $\tilde{\sigma}_r$ is given by

$$\text{Eff } \tilde{\sigma}_r = \frac{\text{var } \hat{\sigma}}{\text{var } \tilde{\sigma}_r} \tag{19}$$

while the efficiency of $\tilde{\sigma}_{r,r'}$ is given by

$$\text{Eff } \tilde{\sigma}_{r,r'} = \frac{\text{var } \hat{\sigma}}{\text{var } \tilde{\sigma}_{r,r'}}. \tag{20}$$

By varying the weighting factor $\lambda_{r,r'}$, one may obtain a one-parameter family of unbiased estimators $\tilde{\sigma}_{r,r'}$. However, there is just one value of $\lambda_{r,r'}$ which minimizes $V_{r,r'} = \text{var } \tilde{\sigma}_{r,r'}$, and hence maximizes Eff $\tilde{\sigma}_{r,r'}$. This value of $\lambda_{r,r'}$ which maximizes the efficiency of the estimator may be obtained by setting $dV_{r,r'}/d\lambda_{r,r'} = 0$ and solving for $\lambda_{r,r'}$, and is given by

$$\lambda_{r,r'} = \frac{E(w_{r'})\ \text{var}\ w_r - E(w_r)\ \text{cov}\ (w_r, w_{r'})}{E(w_r)\ \text{var}\ w_{r'} - E(w_{r'})\ \text{cov}\ (w_r, w_{r'})}. \tag{21}$$

Table A4 gives the efficiency of estimators based on w_r for $r = 0(1)8$ and $n = (2r+2)(1)100$, accurate to within 0.01 percent. Table A5 gives the most efficient estimator based on one sample quasi-range, together with its efficiency, for $n = 2(1)100$, also the most efficient estimators based on linear combinations of two adjacent quasi-ranges and of any two quasi-ranges ($r < r' \leq 8$), together with their efficiencies, for $n = 4(1)100$, and the efficient estimator based on the sample standard deviation. For the estimators based on one sample quasi-range, the numerical coefficients $1/E(w_r)$ are accurate to within a unit in the sixth decimal place, and the efficiencies are accurate to within 0.01 percent. For the estimators based on a linear combination of two quasi-ranges, the numerical coefficients $1/E(w_r + \lambda_{r,r'}w_{r'})$ are accurate to within a unit in the fourth decimal place, the values of $\lambda_{r,r'}$ are accurate to within a unit in the third decimal place, and the efficiencies are accurate to within 0.01 percent. The efficiency of the estimators based on quasi-ranges is shown graphically by Figure 1. It will be noted that for $n < 56$ the estimator based on the best linear combination of any two quasi-ranges ($r < r' \leq 8$) always involves the range ($r = 0$), with $1 \leq r' \leq 5$, while the best such estimator for $56 \leq n \leq 100$ is $\tilde{\sigma}_{1,8}$, with the efficiency dropping to 82.71 percent for $n = 100$. It seems likely that slightly better estimators for n near 100 could be obtained by dropping the restriction $r' \leq 8$, but it is doubtful whether the increase in efficiency would exceed 1 percent, which would hardly justify the additional computation of expected values, variances, and covariances required to obtain such estimators. One may wonder why the best estimator based on a linear combination of two quasi-ranges is not the one based on a linear combination of the two quasi-ranges which do best individually. A little reflection, however, will convince one that these two quasi-ranges, which are certainly adjacent ones, are too highly correlated to do best together.

1.4. COMPARISON WITH GRUBBS-WEAVER ESTIMATORS

Grubbs and Weaver (1947) have proposed estimators of the population standard deviation based on a weighted average of the ranges of random subgroups of the complete sample. Since the optimum size of such subgroups is 8, the sample is divided into subgroups which are as nearly as possible of size 8. If the sample size is an integral multiple of 8, all subgroups are of size 8; otherwise, some subgroups will not be of size 8, since no observations are discarded. The Grubbs-Weaver estimator is always more efficient than the estimator $\tilde{\sigma}_r$ based on one sample quasi-range, except for $n < 12$, when it is identical with $\tilde{\sigma}_r$, both using the range of the complete sample, and always less efficient than the estimator based on the best linear combination of any two quasi-ranges, at least for samples up through size 100. The Grubbs-Weaver estimator is less efficient than the estimator based on the best linear combination of two adjacent quasi-ranges for $n \leq 34$, but more efficient for $n \geq 35$. It can be shown that the asymptotic efficiency (as sample size approaches infinity) of

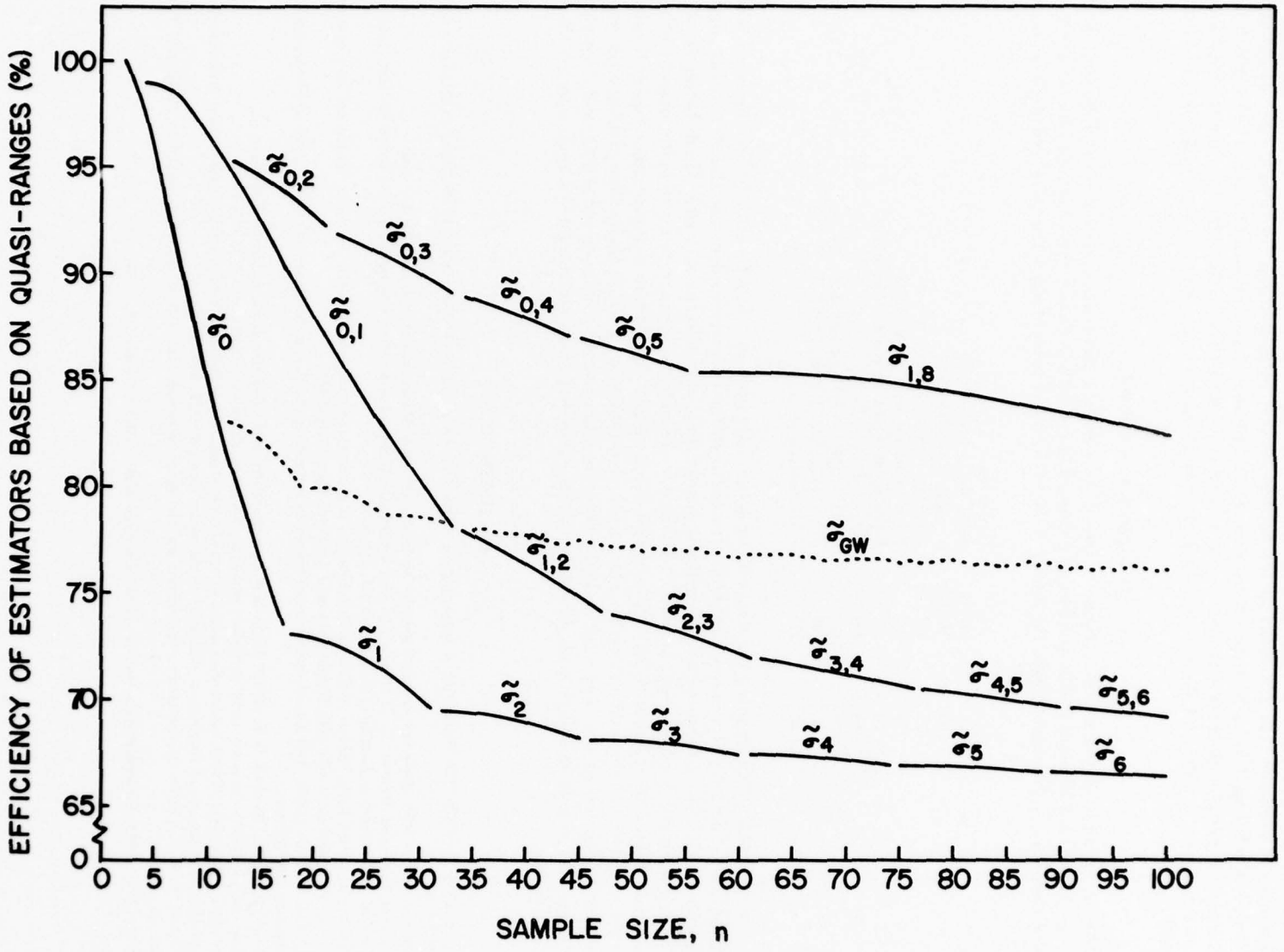

FIG. I. EFFICIENCY OF ESTIMATORS OF STANDARD DEVIATION FOR NORMAL POPULATION

the Grubbs-Weaver estimator is 75.38 percent. No similar figure for the efficiency of estimators based on quasi-ranges is available. The efficiency of the Grubbs-Weaver estimator $\tilde{\sigma}_{GW}$ for sample sizes up through 100 is shown in Figure 1 along with the efficiencies of the estimators based on quasi-ranges. The irregularities in $\tilde{\sigma}_{GW}$ are due partly to the inherent nature of the estimators and partly to the fact that the number of decimal places carried by Grubbs and Weaver is sufficient to yield values of the efficiency accurate only to within about 0.1 percent.

1.5. NUMERICAL EXAMPLE

As an example of the use of estimators based on sample quasi-ranges, consider the following data, given by Morse and Kimball (1950), p. 134 and assumed to come from a normal population, which represent the deviation (in one dimension) from the aiming point of the mean point of impact of salvos of two projectiles:

−237	−23	Quasi-ranges:
−133	−13	$w_0 = 270 - (-237) = 507$
−93	−10	$w_1 = 209 - (-133) = 342$
−77	57	$w_2 = 173 - (-93) = 266$
−75	65	Sample standard deviation: $s = 127.2$
−70	142	Estimates of population standard deviation:
−66	154	$\tilde{\sigma}_1 = .355214\ w_1 = 121.5$
−65	173	$\tilde{\sigma}_{0,1} = .12670(w_0 + 1.4769w_1) = 128.2$
−34	209	$\tilde{\sigma}_{0,2} = .14192(w_0 + 1.4640w_2) = 127.2$
−28	270	$\hat{\sigma} = s/.986934 = 128.9$

Morse and Kimball (1950) plotted the data on normal probability paper, fitted a straight line "by eye", and estimated the standard deviation as the difference between the 84 percent point and the 50 percent point, the result being 161, a value nearly 25 percent greater than the efficient estimate. Much better results could have been obtained by using an estimator based on a single quasi-range, and still better ones by using an estimator based on a linear combination of two quasi-ranges. In addition to giving much better results, arranging the data in order and making the simple calculations shown above is easier than plotting on normal probability paper (though one may want to do the latter for other reasons). Moreover, it is really not necessary to arrange all the data in order; it would suffice in this example to pick out the three largest and the three smallest values.

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2. INTERVAL ESTIMATION OF THE POPULATION STANDARD DEVIATION σ*

2.1. INTRODUCTION

Since the appearance of a justification by E. S. Pearson and Haines (1935), it has been common practice to use the range of small samples to estimate the population standard deviation σ. For the normal population, the efficiency of estimators based on the sample range decreases quite rapidly as the sample size n increases. Mosteller (1946) advanced the suggestion, which was latent in a paper by Karl Pearson (1920), of using quasi-ranges of larger samples to estimate σ. Harter (1958, 1959) has tabulated the most efficient unbiased estimators of σ based on one quasi-range for samples of size $n = 2(1)100$ from normal, rectangular, and exponential populations and on linear combinations of two quasi-ranges for samples of size, $n = 4(1)100$ from the normal population. The tables for the normal and rectangular populations are included as Tables A5 and B1 of the present volume, and the related theory is given in Chapter I, Section 1 and Chapter II, Section 1. Chu, Leone, and Topp (1957) have proposed a procedure, using sample quasi-ranges, of setting confidence bounds for the population standard deviation. Leone, Rutenberg, and Topp (1961) have obtained approximate confidence bounds for the standard deviation of normal, exponential, and rectangular populations by first applying distribution-free methods and then imposing the distribution. Though the basic procedure is sound, the use of distribution-free methods yields approximate confidence intervals which are much longer than the exact ones given in the present volume.

For the normal population, which is the one under consideration here, the range of small samples yields rather good point and interval estimators of σ, but for larger sample sizes, better estimators of both kinds can be obtained from quasi-ranges, with the optimum order of the quasi-range increasing with sample size. In order to determine the coefficients of the rth quasi-range w_r in the exact confidence bounds for σ, it has been necessary to tabulate the probability integral of the rth quasi-range, then perform inverse interpolation to determine the percentage points of the rth quasi-range, and finally take the reciprocals of the percentage points. By this method substitute confidence bounds have been determined which compare rather favorably with the conventional confidence bounds based on the sample standard deviation.

Various criteria have been proposed for use in deciding which of a number of substitute confidence bounds or confidence intervals is best. Among these are effectiveness, effectivity, and efficiency, which are defined and discussed in some detail in subsection 2.2. The mathematical formulation is given in subsection 2.3 for the probability integral of the (standardized) rth quasi-range $W_r = w_r/\sigma$ and for the effectiveness and the efficiency of interval estimators based on w_r. Subsection 2.4 describes the method of computation of tables of these functions and tables of percentage points of W_r and coefficients of w_r in exact lower confidence bounds for σ. A comparison of these tables with other tables of substitute confidence intervals for σ is given in subsection 2.5.

The following tables are included in Appendix A: (1) an eight-decimal-place table (Table A6) of the probability integral of the (standardized) rth quasi-range $W_r = w_r/\sigma$ for $r = 0(1)8$ and $n = (2r+2)(1)20(2)40(10)100$, with W_r at intervals of 0.05; (2) a six-decimal-place table (Table A7) of the percentage points of the rth quasi-range W_r corresponding to cumulative probabilities $P = .0001, .0005, .001, .005, .01, .025, .05, .1(.1).9, .95, .975, .99, .995, .999, .9995, .9999$ for the above values of r and n; (3) a table (Table A8), to seven significant figures or six decimal places, whichever is less accurate, of the coefficients of the rth quasi-range w_r in the exact lower confidence bounds for σ for the above values of P, r, and n; (4) a table (Table A9) of the upper and lower $(1-P)$ confidence bounds of the central $(1-2P)$ confidence interval for σ, based on the rth quasi-range, where r is optimized in some sense. Table A9 is divided into four parts according to whether r is chosen so as to maximize (a) the effectiveness F_u of the substitute upper confidence bound, (b) the effectiveness F_i of the substitute central confidence interval, (c) the efficiency E_u of the substitute upper confidence bound, or (d) the efficiency E_i of the substitute central confidence interval. Parts (b) and (d) give results only for those pairs of values of n and $(1-P)$ for which the optimum values of r differ from those in parts (a) and (c), respectively. Values of the effectiveness (F_u and F_i) and the efficiency (E_u and E_i) are given to the nearest tenth of a percent.

*Earlier versions of this material were published by Harter (1963, 1964b).

2.2. CRITERIA FOR BEST SUBSTITUTE INTERVAL ESTIMATORS

2.2.1. GENERAL DISCUSSION

A random subset S of the possible values of a parameter θ is by definition a $(1-\alpha)$ confidence set for θ if $P_\theta(\theta \epsilon S) \geq 1-\alpha$ for all θ. If the equality holds, the confidence set is said to be exact; otherwise it is called approximate. If the parameter θ is that of a continuous distribution, it is usually possible to find exact confidence sets, though it is sometimes easier to find approximate ones. If, on the other hand, the distribution is discrete, it is often impossible to find exact confidence sets with specified confidence $1-\alpha$. Whenever exact confidence sets can be found, they are certainly to be preferred to approximate ones. If a confidence set consists of all the values in an interval, it is called a confidence interval. Confidence intervals may be either one-sided, consisting of all values below an upper bound $\bar{\theta}$ (or above a lower bound θ), or two-sided, consisting of all values between a lower bound $\underline{\theta}$ and an upper bound $\bar{\theta}$. If the confidence associated with the upper bound $\bar{\theta}$ is the same as that associated with the lower bound $\underline{\theta}$, the two-sided confidence interval is called an equal-tailed or central confidence interval.

Confidence sets (confidence $1-\alpha$) are equivalent to a family of tests (significance level α) of the hypothesis $H(\theta')$ against alternatives $\bar{H}(\theta')$ for varying θ'. In the two-sided case, $H(\theta')$ is the hypothesis $\theta=\theta'$ and $\bar{H}(\theta')$ is the hypothesis $\theta \neq \theta'$. In the one-sided case the hypotheses are $H(\theta'):\theta \leq \theta'$ and $\bar{H}(\theta'):\theta > \theta'$ or $H(\theta'):\theta \geq \theta'$ and $\bar{H}(\theta'):\theta < \theta'$. The $(1-\alpha)$-confidence sets are said to be unbiased if the corresponding tests are unbiased, that is if $P_\theta(\theta' \epsilon S) \leq 1-\alpha$ for all θ' such that $\theta \epsilon \bar{H}(\theta')$ and for all θ, so that the probability of covering the false values specified by the alternative hypothesis does not exceed the confidence level. An unbiased confidence set S for θ is said to be uniformly most accurate (Neyman-shortest) if it minimizes $P_\theta(\theta' \epsilon S)$ for all θ' such that $\theta \epsilon \bar{H}(\theta')$ and for all θ. A confidence set satisfying this condition is optimum in the sense that among all unbiased $(1-\alpha)$-confidence sets it uniformly minimizes the probability of covering false values specified by $\bar{H}(\theta')$.

Various criteria have been proposed for deciding which of a number of procedures for determining central confidence intervals is best; most of these can be extended to procedures for determining upper or lower confidence bounds. Perhaps the most widely used criterion is that of minimizing the expected length of the confidence interval. Pratt (1961) has shown that minimizing the expected length of the confidence interval is equivalent to minimizing the integral, over all possible false values, of the probability of covering false values. For one-sided confidence intervals, the expected length is minimized by minimizing (maximizing) the expected value of the upper (lower) confidence bound. The relation proved by Pratt still holds if all possible false values are considered. But if only false values specified by $\bar{H}(\theta')$ are considered, minimizing the integral of the probability of including such false values is equivalent to minimizing the expected excess (shortage) of the upper (lower) confidence bound as compared with the true value [see Madansky (1962)]. It turns out that criteria based on minimizing expected length, expected excess (shortage), or the probability of including false values are not entirely satisfactory, even though they have been widely used. Lehmann (1959) says, "Short intervals are desirable when they cover the true parameter value but not necessarily otherwise." Faced with a situation in which a confidence interval fails to cover the true value, one might prefer an interval made longer by extending it in the direction of the true value and thus including additional false values nearer the true value. Madansky (1962) has given an example in which minimizing the expected length of a confidence interval is not a good criterion.

Possible alternative procedures are to minimize the mean (absolute) deviation or the mean squared deviation of the upper (lower) confidence bound from the true value in the one-sided case, or in the case of a central confidence interval, to minimize the sum of the mean (absolute) deviations or the sum of the mean squared deviations of the upper and lower confidence bounds from the true value. In the sequel, the criterion based upon minimizing the expected length and these two alternative criteria will be discussed with particular reference to the problem of choosing, not the best possible interval estimator (the conventional estimator), but the best substitute interval estimator of a specified class.

2.2.2. EFFECTIVENESS, EFFECTIVITY, AND EFFICIENCY

The effectiveness of a substitute central confidence interval is defined as the ratio, expressed as a percentage, of the expected length of the conventional confidence interval to that of the substitute interval. A logical extension, in the case of a parameter which cannot be negative, results in the definition of the effectiveness of a substitute upper confidence bound as the ratio, expressed as a percentage, of the ex-

pected value of the conventional upper confidence bound to that of the substitute bound. The effectivity of a substitute upper confidence bound is defined as the ratio, expressed as a percentage, of the mean (absolute) deviation of the conventional upper confidence bound from the true parameter value to the mean (absolute) deviation of the substitute upper confidence bound from the true parameter value. Similarly, the effectivity of a substitute central confidence interval is defined as the ratio, expressed as a percentage, of the sum of the mean (absolute) deviations of the conventional upper and lower confidence bounds from the true parameter value to the sum of the mean (absolute) deviations of the substitute upper and lower confidence bounds from the true parameter value. The efficiency of a substitute upper confidence bound is defined as the ratio, expressed as a percentage, of the mean squared deviation of the conventional upper confidence bound from the true parameter value to the mean squared deviation of the substitute upper confidence bound from the true parameter value. Similarly, the efficiency of a substitute central confidence interval is defined as the ratio, expressed as a percentage, of the sum of the mean squared deviations of the conventional upper and lower confidence bounds from the true parameter value to the sum of the mean squared deviations of the substitute upper and lower confidence bounds from the true parameter value.

The above definitions will now be given in symbolic form. Let $(\underline{\theta}, \bar{\theta})$ be the conventional confidence interval, $\underline{\theta}$ and $\bar{\theta}$ being the conventional lower and upper confidence bounds, respectively, and let $(\underline{\theta}', \bar{\theta}')$ be a substitute confidence interval, $\underline{\theta}'$ and $\bar{\theta}'$ being substitute lower and upper confidence bounds, respectively, for the parameter θ. Let E_1, E_2, and E_3 represent effectiveness, effectivity, and efficiency, respectively, all expressed as percentages, with a second subscript, u for upper confidence bounds and i for confidence intervals. Then the equations which give the symbolic definitions are as follows:

$$E_{1u} = 100\, E(\bar{\theta})/E(\bar{\theta}'). \tag{1}$$

$$E_{2u} = 100\, E|\bar{\theta}-\theta|/E|\bar{\theta}'-\theta|. \tag{2}$$

$$E_{3u} = 100\, E[(\bar{\theta}-\theta)^2]/E[(\bar{\theta}'-\theta)^2]. \tag{3}$$

$$E_{1i} = 100\, E(\bar{\theta}-\underline{\theta})/E(\bar{\theta}'-\underline{\theta}'). \tag{4}$$

$$E_{2i} = 100[E|\bar{\theta}-\theta| + E|\underline{\theta}-\theta|]/[E|\bar{\theta}'-\theta| + E|\underline{\theta}'-\theta|]. \tag{5}$$

$$E_{3i} = 100\{E[(\bar{\theta}-\theta)^2] + E[(\underline{\theta}-\theta)^2]\}/\{E[(\bar{\theta}'-\theta)^2] + E[(\underline{\theta}'-\theta)^2]\}. \tag{6}$$

The definition of effectiveness was given by Leone, Rutenberg, and Topp (1961), while the definitions of effectivity and efficiency are due to Harter (1964b), though the latter is a logical extension of the corresponding definition for point estimators. The criterion of maximizing the effectiveness is the same as that of minimizing the expected length of the confidence interval. We have already seen that this criterion is not entirely satisfactory, so we pass on to the others.

Since the numerators of the expressions for effectivity are constant, the criterion of maximizing the effectivity is equivalent to the previously mentioned criterion of minimizing the denominators of these expressions. Use of this procedure overcomes the objections raised to minimizing the expected length of the confidence interval, the probability of including false values, or the expected excess. Its superiority can be seen from the fact that it penalizes estimators for the occurence of cases in which the upper (lower) confidence bound falls short of (exceeds) the true parameter value, whereas minimizing the expected length of the confidence interval or the probability of including false values actually rewards such occurrences and minimizing the expected excess (shortage) or the probability of including false values greater (less) than the true value ignores them. Essentially, this criterion minimizes the sum of the expected excess and the expected shortage for the single confidence bound in the case of a one-sided interval or the sum of their sums for the two confidence bounds in the case of a two-sided interval, thus requiring the bound or bounds to be as near as possible to the true value regardless of whether they fall above it or below it. Despite these desirable properties, this criterion is nevertheless not the final answer, since it depends upon the mathematical manipulation of expressions involving absolute values, which are notoriously intractable.

The criterion of maximizing the efficiency is equivalent to the previously mentioned criterion of minimizing the expression in the denominator, since the numerator is constant. This criterion has all the advantages mentioned above for the criterion of maximizing the effectivity, and in addition is mathematically much more tractable, since the absolute values have been replaced by squares. We shall see later that it has certain other nice properties from a practical viewpoint, and these confirm the indication of theoretical considerations that it is the best criterion so far advanced.

2.3. MATHEMATICAL FORMULATION

2.3.1. PROBABILITY INTEGRAL OF rth QUASI-RANGE $W_r = w_r/\sigma$

The probability density function of the (standardized) rth quasi-range for samples of size n from $N(\mu, 1)$ is given [see Cadwell (1953)] by

$$f(W_r, n) = \frac{n!}{(n-2r-2)!(r!)^2} \int_{-\infty}^{\infty} \left[\frac{1}{2} + \Phi(x)\right]^r \left[\frac{1}{2} - \Phi(x+W_r)\right]^r [\Phi(x+W_r) - \Phi(x)]^{n-2r-2} \phi(x)\phi(x+W_r)\,dx. \quad (7)$$

where $\Phi(x) = \int_0^x \phi(x)\,dx$ and $\phi(x) = (2\pi)^{-1/2} e^{-x^2/2}$. Integrating with respect to W_r between the limits 0 and W_r, we obtain the probability integral of the rth quasi-range in the form

$$P(W_r, n) = \frac{n!}{(n-2r-2)!(r!)^2} \int_0^{W_r} \int_{-\infty}^{\infty} \left[\frac{1}{2} + \Phi(x)\right]^r \left[\frac{1}{2} - \Phi(x+W_r)\right]^r [\Phi(x+W_r) - \Phi(x)]^{n-2r-2} \phi(x)\phi(x+W_r)\,dx\,dW_r. \quad (8)$$

If we change the order of integration, this becomes

$$P(W_r, n) = \frac{n!}{(n-2r-2)!(r!)^2} \int_{-\infty}^{\infty} \left[\frac{1}{2} + \Phi(x)\right]^r \phi(x) \int_0^{W_r} \left[\frac{1}{2} - \Phi(x+W_r)\right]^r [\Phi(x+W_r) - \Phi(x)]^{n-2r-2} \phi(x+W_r)\,dW_r dx. \quad (9)$$

Integration by parts r times then yields

$$P(W_r, n) = \int_{-\infty}^{\infty} \sum_{k=0}^{r} \frac{n(n-1)\ \ldots\ (n-2r+k)}{r!(r-k)!} \left[\frac{1}{2} - \Phi(x+W_r)\right]^{r-k} [\Phi(x+W_r) - \Phi(x)]^{n-2r+k-1} \left[\frac{1}{2} + \Phi(x)\right]^r \phi(x)\,dx. \quad (10)$$

from which the probability integral may be computed by numerical integration. The percentage points of W_r, whose reciprocals are the coefficients of w_r in the exact confidence bounds for σ, may then be obtained by inverse interpolation.

2.3.2. EFFECTIVENESS OF INTERVAL ESTIMATORS OF σ BASED ON w_r

If we consider the standardized population ($\sigma = 1$), which we may do without loss of generality, the conventional upper and lower confidence bounds (confidence $1-P$) for σ are given by $B_u = [(n-1)s^2/\chi^2_{P,\,n-1}]^{1/2}$ and $B_l = [(n-1)s^2/\chi^2_{1-P,\,n-1}]^{1/2}$, respectively, where $s^2 = \Sigma(x-\bar{x})^2/(n-1)$ is the sample variance and $\chi^2_{P,\,n-1}$ and $\chi^2_{1-P,\,n-1}$ are the percentage points of the chi-square distribution with $(n-1)$ degrees of freedom, corresponding to cumulative probabilities P and $1-P$, respectively. Similarly, the substitute upper and lower confidence bounds (confidence $1-P$), based on the rth quasi-range w_r, are given by $B_{ur} = w_r/w_{r,\,P}$ and $B_{lr} = w_r/w_{r,\,1-P}$, respectively, where $w_{r,\,P}$ and $w_{r,\,1-P}$ are the percentage points of the distribution of w_r corresponding to cumulative probabilities P and $1-P$, respectively.

Since $E(s)=[2/(n-1)]^{1/2}\Gamma(n/2)/\Gamma[(n-1)/2]$, the expected values of the conventional upper and lower confidence bounds are given by

$$E(B_u)=\{2^{1/2}\Gamma(n/2)/\Gamma[(n-1)/2]\}\{1/[\chi^2_{P,n-1})]^{1/2}\} \tag{11}$$

and

$$E(B_l)=\{2^{1/2}\Gamma(n/2)/\Gamma[(n-1)/2]\}\{1/[\chi^2_{1-P,n-1})]^{1/2}\} \tag{12}$$

respectively, and hence the expected length of the conventional central confidence interval is given by

$$E(B_u-B_l)=\{2^{1/2}\Gamma(n/2)/\Gamma[(n-1)/2]\}\{1/[\chi^2_{P,n-1}]^{1/2}-1/[\chi^2_{1-P,n-1}]^{1/2}\}. \tag{13}$$

The expected values of the substitute upper and lower confidence bounds are given by

$$E(B_{ur})=(1/w_{r,P})E(w_r) \tag{14}$$

and

$$E(B_{lr})=(1/w_{r,1-P})E(w_r) \tag{15}$$

respectively, and hence the expected length of the substitute central confidence interval is given by

$$E(B_{ur}-B_{lr})=[(1/w_{r,P})-(1/w_{r,1-P})]E(w_r). \tag{16}$$

Then it follows from the definition of effectiveness that the effectiveness $F_u=E_{1u}$ of the substitute upper confidence bound is given by

$$F_u=100E(B_u)/E(B_{ur}), \tag{17}$$

where $E(B_u)$ and $E(B_{ur})$ are given by Equations (11) and (14), respectively, and that the effectiveness $F_i=E_{1i}$ of the substitute central confidence interval is given by

$$F_i=100E(B_u-B_l)/E(B_{ur}-B_{lr}), \tag{18}$$

where $E(B_u-B_l)$ and $E(B_{ur}-B_{lr})$ are given by Equations (13) and (16), respectively.

2.3.3. EFFICIENCY OF INTERVAL ESTIMATORS OF σ BASED ON w_r

If we again assume, without loss of generality, that $\sigma=1$, the mean squared deviation of the conventional upper confidence bound from the true parameter value may be written in the form

$$E(D^2_{c,u})=E[(B_u-1)^2]=E\{([(n-1)s^2/\chi^2_{P,n-1}]^{1/2}-1)^2\}=\{\chi^2_{P,n-1}-2[(n-1)\chi^2_{P,n-1}]^{1/2}E(s)+(n-1)E(s^2)\}/\chi^2_{P,n-1}. \tag{19}$$

Since $E(s)=[2/(n-1)]^{1/2}\Gamma[(n-1)/2]$ and $E(s^2)=1$, Equation (19) may be written in the form

$$E(D^2_{c,u})=\{\chi^2_{P,n-1}-2^{3/2}\Gamma(n/2)[\chi^2_{P,n-1}]^{1/2}/\Gamma[(n-1)/2]+n-1\}/\chi^2_{P,n-1}. \tag{20}$$

Similarly, the mean squared deviation of the conventional lower confidence bound from the true parameter value is given by

$$E(D^2_{c,l})=\{\chi^2_{1-P,n-1}-2^{3/2}\Gamma(n/2)[\chi^2_{1-P,n-1}]^{1/2}/\Gamma[(n-1)/2]+n-1\}/\chi^2_{1-P,n-1}. \tag{21}$$

The mean squared deviation of the substitute upper confidence bound, based on the rth quasi-range, from the true parameter value may be written in the form

$$E(D^2_{s,u}) = E[(B_{ur}-1)^2] = E[(w_r/w_{r,P}-1)^2] = [w^2_{r,P} - 2w_{r,P}E(w_r) + E(w_r^2)]/w^2_{r,P}. \tag{22}$$

Since $E(w_r^2) = E^2(w_r) + \text{var } w_r$, Equation (22) may be written in the form

$$E(D^2_{s,u}) = [w^2_{r,P} - 2w_{r,P}E(w_r) + E^2(w_r) + \text{var } w_r]/w^2_{r,P}. \tag{23}$$

Similarly, the mean squared deviation of the substitute lower confidence bound, based on the rth quasi-range, from the true parameter value may be written in the form

$$E(D^2_{s,l}) = [w^2_{r,1-P} - 2w_{r,1-P}E(w_r) + E^2(w_r) + \text{var } w_r]/w^2_{r,1-P}. \tag{24}$$

The efficiency $E_u = E_{3u}$ of the substitute upper confidence bound is given by

$$E_u = 100E(D^2_{c,u})/E(D^2_{s,u}) \tag{25}$$

and the efficiency $E_i = E_{3i}$ of the substitute central confidence interval is given by

$$E_i = 100[E(D^2_{c,u}) + E(D^2_{c,l})]/[E(D^2_{s,u}) + E(D^2_{s,l})]. \tag{26}$$

2.4. METHOD OF COMPUTATION OF THE TABLES

2.4.1. PROBABILITY INTEGRAL OF rth QUASI-RANGE $W_r = w_r/\sigma$

Values of $P(W_r, n)$ were computed from equation (10) for W_r at intervals of 0.01, starting at $W = 0.01$ and continuing until $P(W_{r,n}) > 0.999999995$, for $r = 0(1)8$ and $n = (2r+2)(1)20(2)40(10)100$. Double precision arithmetic was used on the IBM 7090 computer, and the trapezoidal rule was employed for the numerical integration. Input values of $\phi(x)$ and $\Phi(x)$ were taken from tables computed by the WPA Mathematical Tables Project (1942). Because of the sheer volume of the results, it was decided to publish a table only for those values of W_r which are multiples of 0.05. Results for these values of W_r were rounded to eight decimal places and the rounded values were punched on IBM cards. The results are shown in Table A6, which was reproduced from a listing of the cards on the IBM 407 tabulator. To obtain sufficiently accurate values of the percentage points, the computation of which is described in subsection 2.4.2, it was necessary to use the unrounded values of $P(W_r, n)$ at intervals of 0.01 in W_r, so these were retained in the memory until after the inverse interpolation had been performed. Because of the presence of both truncation errors and rounding errors, the unrounded values are not accurate to the full extent of double precision (approximately 16 significant decimal digits), but they are accurate to at least 10 decimal places, since the numerical integration was performed by starting with interval $h(x) = 0.32$ and halving the interval until successive values differed by no more than 10^{-10}.

2.4.2. PERCENTAGE POINTS OF rth QUASI-RANGE $W_r = w_r/\sigma$

The percentage points of the rth quasi-range corresponding to cumulative probabilities $P = 0.0001$, 0.0005, 0.001, 0.005, 0.01, 0.025, 0.05, 0.1(0.1)0.9, 0.95, 0.975, 0.99, 0.995, 0.999, 0.9995, 0.9999 for the above values of r and n were computed from the unrounded and unabridged table of the probability integral by inverse interpolation on the IBM 7090, by use of Aitken's method with double precision. First linear (2-point) interpolation was used, then quadratic (3-point), and the number of points was increased in steps of one until successive interpolated values agreed to 24 significant binary bits (corresponding to a little more than 7 significant decimal digits) or until 20 points had been used in the interpolation. In case the tolerance had not been met by the time 20-point interpolation had been performed, the probability integral was subtabulated at subintervals of 0.001 in the interval (of width 0.01) containing the required percentage point and in the two adjacent intervals, with error no greater than 10^{-10} in the subtabulated values. Then the inverse interpolation was repeated, and if the tolerance still could not be met, alternate subtabulation (at a sub-

interval 1/10 as large as before) and inverse interpolation were continued until the tolerance had been met. Since direct interpolation is more accurate than inverse interpolation in this case, the calculated percentage points were checked by direct interpolation. This was done by checking whether the probabilities found by direct interpolation for values 5×10^{-7} more and 5×10^{-7} less than each calculated percentage point bracket the required probability. In the few cases for which the check failed, the calculated percentage points were adjusted so that bracketing was achieved. The resulting percentage points were rounded to six decimal places and the rounded values were punched on IBM cards. The results are shown in Table A7, which was reproduced from a listing of the cards on the IBM 407 tabulator.

2.4.3. COEFFICIENTS OF w_r IN EXACT CONFIDENCE BOUNDS FOR σ

The coefficients of the rth quasi-range w_r in the exact lower confidence bounds (confidence P) for σ are the reciprocals of the percentage points of the (standardized) rth quasi-range W_r for the same values of P, r, and n. These coefficients were calculated, double-precision arithmetic being used on the IBM 7090, by taking the reciprocals of the unrounded and unadjusted values of the corresponding percentage points. Values of the coefficients were to be rounded to seven significant digits or six decimal places, whichever is less accurate, but before this was done 5 was added and subtracted in the position of the leftmost digit to be discarded, reciprocals were taken, probabilities were found by direct interpolation, and bracketing was checked as above. After adjustment if necessary to achieve bracketing and after rounding, the rounded values were punched on IBM cards and listed on the IBM 407 tabulator, as reproduced in Table A8.

2.4.4. EFFECTIVENESS OF INTERVAL ESTIMATORS OF σ BASED ON w_r

The expected values of the conventional upper confidence bounds and the expected lengths of the conventional central confidence intervals were computed from Equations (11) and (13), respectively, for $n=2(1)20(2)40(10)100$ and $P=0.0001$, .0005, .001, .005, .01, .025, .05, .1(.1).5, use being made of a new table of percentage points of the chi-square distribution computed by Harter (1964a). The expected values of the substitute upper confidence bounds and the expected lengths of the substitute central confidence intervals were computed from Equations (14) and (16), respectively, for the same values of n and P with $r=0(1)$ min $([2n-2], 8)$, with the aid of tables of expected values of w_r (Table A1) and coefficients of w_r in exact lower confidence bounds for σ (Table A8). The effectivenesses of the substitute upper confidence bounds and the substitute central confidence intervals were then computed from Equations (17) and (18), respectively, all computations being performed on the IBM 7090 computer, and the results were rounded to the nearest tenth of one percent. These results, together with the corresponding values of n, r, $1-P$, and $1-2P$ and the coefficients of w_r in the exact upper and lower confidence bounds for σ, were punched on IBM cards. These cards were sorted manually. For each pair of values of n and $1-P$, the card for that value of r which maximizes the effectiveness of the upper confidence bound (confidence $1-P$) was placed in deck A. In most cases (all but 59 out of 385), the same value of r also maximizes the effectiveness of the central confidence interval (confidence $1-2P$). For each of the 59 cases in which this is not true, an asterisk was punched after the effectiveness of the central confidence interval in the card in deck A, and the card for the value of r which does maximize the effectiveness of the central confidence interval was placed in deck B. All cards not belonging either to deck A or deck B were discarded. Table A9A was reproduced from a listing of deck A and Table A9B from a listing of deck B on the IBM 407 tabulator.

2.4.5. EFFICIENCY OF INTERVAL ESTIMATORS OF σ BASED ON w_r

The mean squared deviations of the conventional upper and lower confidence bounds from the true parameter value were computed from Equations (20) and (21), respectively, for the values of n and P listed in subsection 2.4.4., use again being made of the table of percentage points of chi-square. The mean squared deviations of the substitute upper and lower confidence bounds from the true parameter value were computed from Equations (23) and (24), respectively, for the values of n, r, and P listed in subsection 2.4.4, with the aid of tables of the expected value and the variance of w_r (Tables A1 and A2), percentage points of w_r (Table A7), and coefficients of w_r in exact lower confidence bounds for σ (Table A8). The efficiencies of the substitute upper confidence bounds and the substitute central confidence intervals were then computed from Equations (25) and (26), respectively, all computations being performed on the IBM 7090 computer, and the results were rounded to the nearest tenth of one percent. These results, together with the corresponding values of n, r, $1-P$, and $1-2P$ and the coefficients of w_r in the exact upper and lower confidence bounds

for σ, were punched on IBM cards. These cards were sorted manually. For each pair of values of n and $1-P$, the card for that value of r which maximizes the efficiency of the upper confidence bound (confidence $1-P$) was placed in deck C. In most cases (all but 22 out of 385), the same value of r also maximizes the efficiency of the central confidence interval (confidence $1-2P$). For each of the 22 cases in which this is not true, an asterisk was punched after the efficiency of the central confidence interval in the card in deck C, and the card for the value of r which does maximize the efficiency of the central confidence interval was placed in deck D. All cards not belonging either to deck C or to deck D were discarded. Table A9C was reproduced from a listing of deck C and Table A9D from a listing of deck D on the IBM 407 tabulator.

In addition to the theoretical advantages mentioned in subsection 2.2.2, an examination of Table A9 shows that the criterion of maximizing the efficiency has the following practical advantages over that of maximizing the effectiveness for the problem under consideration: (a) there are fewer cases (22 vs. 59) in which the optimum value of r for the central confidence interval differs from that for the upper confidence bound; (b) the optimum values of r agree more closely with those for point estimation (see Table A5); and (c) for a given value of n, the optimum value of r varies less with changes in P. The criterion of maximizing the effectivity has not been tried because of computational difficulties.

2.5. COMPARISON WITH OTHER TABLES

The effectiveness of the shortest exact central confidence intervals based on one quasi-range never falls below 81 percent for any case included in Tables A9A and A9B, and for small samples it is much higher (100 percent for samples of size 2). This compares with an effectiveness which never reaches 49 percent and is considerably lower for small samples in the case of the approximate central confidence intervals of Leone, Rutenberg, and Topp (1961). This marked difference in effectiveness is due to the superiority of the exact method based on the probability integral and percentage points of the particular distribution under study over the approximation based on using distribution-free methods and afterward imposing the particular distribution. The effectiveness of the exact central confidence intervals could have been made slightly higher by optimizing the upper and lower confidence bounds separately as Leone, Rutenberg, and Topp did for their approximate confidence intervals. It was decided that the small increase in effectiveness that would have resulted was not worth the additional complication of having the upper and lower confidence bounds based on different quasi-ranges. In comparing results, it should be noted that Leone, Rutenberg, and Topp call the range the 1st rather than the 0th quasi-range, so that their quasi-range of order $r+1$ corresponds to the rth quasi-range in the present volume.

The values given in Table A9A for the effectiveness of the lowest exact upper confidence bounds never fall below 92 percent. No comparable values are available in other tables.

The efficiency of the exact central confidence intervals based on one quasi-range never falls below 65 percent and that of the exact upper confidence bounds based on one quasi-range never falls below 64 percent for any case included in Tables A9C and A9D. Again no directly comparable values are available from other tables, though it is interesting to note that the efficiency of interval estimators is approximately the same as that of the corresponding point estimators. Since the efficiency is the ratio of two mean squared deviations, the effectivity is the ratio of two mean (absolute) deviations, and the effectiveness is the ratio of two lengths, one would expect the efficiency to be roughly equal to the square of the effectivity and, in the case of central confidence intervals, also roughly equal to the square of the effectiveness. The values in Table A9 confirm this latter approximation. In the case of upper confidence bounds, however, it does not work out this way; since the effectiveness of an upper confidence bound is defined as that of a confidence interval extending from a fixed lower bound (0) to the upper bound, and since the upper confidence bound approaches the true value of the parameter as $n \to \infty$, the effectiveness of a substitute upper confidence bound approaches 100 percent as $n \to \infty$.

Chapter II and Appendix B of this volume will give 100 percent effective (or efficient) upper confidence bounds and central confidence intervals, based on the sample range, for the standard deviation of a rectangular population. The results for rectangular and normal populations demonstrate the feasibility of interval estimation of the standard deviation of symmetric populations from sample quasi-ranges. The situation is different for non-symmetric populations; for the one-parameter negative exponential population, for example (see Chapter IV and Appendix D), better point and interval estimators can be obtained from a single order statistic than from a quasi-range.

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CHAPTER II

THE RANGE OF SAMPLES FROM A RECTANGULAR POPULATION

1. POINT ESTIMATION OF THE POPULATION STANDARD DEVIATION σ*

1.1. UNBIASED ESTIMATOR WHEN POPULATION IS KNOWN TO BE RECTANGULAR

For the standard rectangular population (mean zero and variance one), the probability density function is

$$f(x) = 1/2\sqrt{3}, \qquad (-\sqrt{3}, \sqrt{3}). \tag{1}$$

It can be shown that the probability density function of the rth quasi-range, w_r, for samples of n is

$$g(w_r) = \frac{1}{(2\sqrt{3})^n B(n-2r-1, 2r+2)} w_r^{n-2r-2} (2\sqrt{3} - w_r)^{2r+1}. \tag{2}$$

Then the expected value of w_r is given by

$$E(w_r) = \int_0^{2\sqrt{3}} w_r g(w_r) dw_r = \frac{n-2r-1}{n+1} (2\sqrt{3}). \tag{3}$$

and the expected value of w_r^2 is given by

$$E(w_r^2) = \int_0^{2\sqrt{3}} w_r^2 g(w_r) dw_r = \frac{12(n-2r)(n-2r-1)}{(n+1)(n+2)}. \tag{4}$$

From Equations (3) and (4), one can obtain the variance of w_r, which is given by

$$\text{var } w_r = E(w_r^2) - [E(w_r)]^2 = \frac{12(2r+2)(n-2r-1)}{(n+1)^2(n+2)}. \tag{5}$$

An unbiased estimator of the standard deviation of a rectangular population is given by

$$\tilde{\sigma}_r = w_r / E(w_r). \tag{6}$$

where $E(w_r)$ is understood to be the expected value for $R(0, 1)$, the standard rectangular population whose probability density function is given by Equation (1). The variance of $\tilde{\sigma}_r$ is

$$\text{var } \tilde{\sigma}_r = \frac{\text{var } w_r}{[E(w_r)]^2} = \frac{2r+2}{(n+2)(n-2r-1)}. \tag{7}$$

From Equation (7), it is evident that the range is more efficient than any of the quasi-ranges for estimating σ, since increasing r both increases the numerator and decreases the denominator of var $\tilde{\sigma}_r$. As a matter of fact, it can be shown that the range is both an efficient and a sufficient statistic for estimating the standard deviation of a rectangular population. Table B1 gives the unbiased estimator $\tilde{\sigma}_0$ for $n = 2(1)100$. The numerical coefficients $1/E(w_0)$ are accurate to within a unit in the sixth decimal place. Since the efficiency is always 100 percent, it is not given in the table.

*Earlier versions of this material were published by Harter (1958, 1959).

1.2. BIAS WHEN ESTIMATORS WHICH ASSUME NORMALITY ARE USED

Section 1.1 covers the case when the population being sampled is known to be rectangular. Suppose, however, that the population is of this type, but the investigator who is interested in estimating the standard deviation is not aware of this fact, and proceeds to use one of the estimators which assume normality. In this case, the estimator is no longer unbiased. The bias of an estimator, based on one sample quasi-range, which assumes normality, when the population being sampled is actually of some other type is given by

$$B_o = \frac{E_o(w_r) - E_n(w_r)}{E_n(w_r)}. \tag{8}$$

The bias of an estimator, based on a linear combination of two sample quasi-ranges, which assumes normality, when the population being sampled is actually of some other type is given by

$$B_o = \frac{[E_o(w_r) + \lambda_{r,r'} E_o(w_{r'})] - [E_n(w_r) + \lambda_{r,r'} E_n(w_{r'})]}{E_n(w_r) + \lambda_{r,r'} E_n(w_{r'})}. \tag{9}$$

In equations (8) and (9), E_n represents the expected value for the normal population, while E_o represents the expected value for the other population, both populations having variance one. Table B1 gives the bias B_r for a rectangular population when the estimators of Table A5, which assume normality, are used. The values of the bias are accurate to within 0.01 percent.

1.3. REFERENCES

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2. INTERVAL ESTIMATION OF THE POPULATION STANDARD DEVIATION σ*

2.1. INTRODUCTION

A general discussion of point and interval estimation of the population standard deviation σ, based on the sample range and quasi-ranges, has been given in Chapter I and will not be repeated here. For the rectangular population, which is the one under consideration in this chapter, the efficient point estimator of the population standard deviation is the one based on the sample range. Similarly, interval estimators based on the sample range are more effective (efficient) than those based on any of the sample quasi-ranges. In order to determine the coefficients of the sample range w in the exact lower confidence bounds for σ, it has been necessary to tabulate the probability integral of the range, then perform inverse interpolation to determine the percentage points of the range, and finally take the reciprocals of the percentage points. A discussion is given of the method of computation. The following tables are included in Appendix B: (1) An eight-decimal-place table (Table B2) of the probability integral of the range for $W = 0.01(0.01)3.46(0.001)3.464$ and $n = 2(1)20(2)40(10)100$; (2) a six-decimal-place table (Table B3) of the percentage points of the range corresponding to cumulative probabilities $P = 0.0001, 0.0005, 0.001, 0.005, 0.01, 0.025, 0.05, 0.1(0.1)0.9, 0.95, 0.975, 0.99, 0.995, 0.999, 0.9995, 0.9999$ for the same values of n; and (3) a table (Table B4), to seven significant figures or six decimal places, whichever is less accurate, of the coefficients of the sample range w in the exact lower confidence bounds for σ for the above values of P and n. The exact confidence intervals between bounds corresponding to P and $(1-P)$ for $P = 0.995, 0.990, 0.975, 0.950, 0.900$ are much shorter than the approximate confidence intervals obtained by Leone, Rutenberg, and Topp (1961), especially for n small and P small ($1-P$ large).

2.2. METHOD OF COMPUTATION OF THE TABLES

2.2.1. PROBABILITY INTEGRAL OF THE RANGE $W = w/\sigma$

The probability integral of the range W for samples of size n from $R(\mu, 1)$, the rectangular population with mean μ and variance 1, may be written [see Kenney and Keeping (1951), p. 192] in the form

$$P(W, n) = \left(\frac{W}{2\sqrt{3}}\right)^{n-1}\left[1 + (n-1)\left(1 - \frac{W}{2\sqrt{3}}\right)\right]. \tag{1}$$

Values of $P(W, n)$ were computed from Equation (1) for $W = 0.01(0.01)3.46\ (0.001)3.464$ and $n = 2(1)20(2)40(10)100$. Double-precision, floating-point arithmetic was used on the Univac Scientific (ERA 1103A) computer. The results were rounded to eight decimal places and the rounded values were punched on IBM cards. The results are shown in Table B2, which was reproduced from a listing of the cards on the IBM 407 tabulator.

2.2.2. PERCENTAGE POINTS OF THE RANGE $W = w/\sigma$

The percentage points of the range corresponding to cumulative probabilities $P = 0.0001, 0.0005, 0.001, 0.005, 0.01, 0.025, 0.05, 0.1(0.1)0.9, 0.95, 0.975, 0.99, 0.995, 0.999, 0.9995, 0.9999$ for the above values of n were computed from the unrounded table of the probability integral by inverse interpolation on the ERA 1103A, using the following iterative procedure:

1. In the table of the probability integral of the range (Table B2) for the desired value of n, find the two successive probabilities, y_0 and y_1, between which the required cumulative probability P lies. Call the two corresponding arguments (ranges) x_0 and x_1.
2. Perform linear inverse interpolation to find an approximation x to the required W, using the relation

$$x = \frac{(x_1 - x_0)(P - y_0)}{y_1 - y_0} + x_0.$$

3. Take, as the tolerance for W, $T = x \cdot 2^{-27}$.

*Earlier versions of this material were published by Harter (1961 a, b).

4. Compute $P(x, n)$ by substituting x for W in Equation (1).

5. (a) If $P(x, n) > P$, replace x_1 by x and y_1 by $P(x, n)$, then repeat step (2).
   (b) If $P(x, n) < P$, replace x_0 by x and y_0 by $P(x, n)$, then repeat step (2).

6. If the absolute value of the difference between the latest x and the next preceding x is less than T, set W equal to the latest x. Otherwise, using the latest x, repeat steps (4) and (5) *until this condition is satisfied*, then set W equal to the last x.

The resulting percentage points were rounded to six decimal places, and the rounded values were punched on IBM cards. The results are shown in Table B3, which was reproduced from a listing of the cards on the IBM 407 tabulator.

2.2.3. COEFFICIENTS OF w IN EXACT CONFIDENCE BOUNDS FOR σ

The coefficients of the sample range w in the lower confidence bounds (confidence P) for the population standard deviation σ were found by taking the reciprocals of the unrounded percentage points of the range for the same values of P and n. The results were rounded to seven significant figures or six decimal places, whichever is less accurate, and the rounded values were punched on IBM cards. The results are shown in Table B4, which was reproduced from a listing of the cards on the IBM 407 tabulator.

2.2.4. CHECK ON THE TABULAR VALUES

The percentage points in Table B3 were checked by verifying that $P(W - 5 \times 10^{-7}, n) < P$ and that $P(W + 5 \times 10^{-7}, n) > P$, using Equation (1). In a similar manner, the coefficients of w in lower confidence bounds for σ (Table B4) were checked by adding and subtracting 5 in the position immediately to the right of that occupied by the least significant digit, taking reciprocals, and then verifying that the corresponding probabilities, as computed from Equation (1), bracket the required probability P.

2.3. EFFECTIVENESS OF CONFIDENCE INTERVALS

Leone, Rutenberg, and Topp (1961) have defined the effectiveness of confidence intervals for σ as the ratio of the expected length $E(l)$ of the (exact) intervals based on the efficient estimator of σ to the expected length $E(l_0)$ of the intervals under consideration. In the case of the rectangular population, the efficient estimator of σ is the one based on the sample range, and hence $E(l)$ is the expected length of the exact confidence intervals for which the coefficients of w are given in Table B4. The effectiveness of the approximate confidence intervals proposed by Leone, Rutenberg, and Topp is the ratio of $E(l)$ to the expected length $E(l_0)$ of the intervals between their approximate lower confidence bounds corresponding to cumulative probabilities P and $1 - P$. Numerical values of the effectiveness (%) of their approximate confidence intervals for $1 - P = 0.995, 0.990, 0.975, 0.950, 0.900$ and $n = 10(10)100$ are as follows:

$1-P$	$n=10$	$n=20$	$n=30$	$n=40$	$n=50$	$n=60$	$n=70$	$n=80$	$n=90$	$n=100$
0.995	12.94	42.78	49.89	53.04	54.82	55.96	56.76	57.34	57.79	58.14
0.990	21.61	45.78	51.71	54.37	55.88	56.85	57.52	58.02	58.40	58.71
0.975	31.79	49.19	53.63	55.65	56.80	57.54	58.06	58.44	58.74	58.97
0.950	38.14	50.90	54.25	55.78	56.66	57.23	57.63	57.93	58.15	58.33
0.900	42.35	50.82	53.10	54.16	54.77	55.16	55.44	55.64	55.80	55.93

2.4. EXAMPLE

Let w be the range of a sample of size $n = 30$ from a rectangular population. Find the lower 97.5 percent confidence bound, the upper 97.5 percent confidence bound, and the two-sided 95 percent confidence interval (with equal tails) for the population standard deviation σ.

By referring to Table B4, one finds that the exact lower 97.5 percent confidence bound is $0.291055w$ and that the exact upper 97.5 percent confidence bound (lower 2.5 percent confidence bound) is $0.348713w$. Obviously, then, the two-sided 95 percent confidence interval (with equal tails) is the interval $(0.291055w, 0.348713w)$.

It is interesting to compare these results with those obtained by Leone, Rutenberg, and Topp, and to look at the exact confidence associated with their approximate confidence bounds. By referring to their Table III, one finds that their approximate lower 97.5 percent confidence bound is $0.288917w$ and that their approximate upper 97.5 percent confidence bound (lower 2.5 percent confidence bound) is $0.396424w$. It can be seen from Table B4 that the actual confidence associated with their lower bound is greater than

0.9995 (approximately 0.9997) and that the actual confidence associated with their upper bound is greater than 0.9990 (approximately 0.9991). Thus their two-sided approximate 95 percent confidence interval $(0.288917w, 0.396424w)$ has unequal tails, and the actual confidence associated with it is approximately $0.9997 - (1 - 0.9991) = 0.9988$.

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CHAPTER III

EXPECTED VALUES OF ORDER STATISTICS OF SAMPLES FROM VARIOUS POPULATIONS

1. NORMAL POPULATION*

1.1. HISTORY

The problem of order statistics has received a great deal of attention from statisticians dating at least as far back as the early years of this century. Karl Pearson (1902) published a solution of a generalization of a problem proposed by Galton (1902). The generalized problem is that of finding the average difference between the pth and the $(p+1)$st individuals in a sample of size n when the sample is arranged in order of magnitude. The result is

$$\frac{n!}{(n-p)!p!}\int_{-\infty}^{\infty}\alpha^{n-p}(1-\alpha)^{p}dx, \tag{1}$$

where $\alpha=\int_{-\infty}^{x}\phi(x)dx$ and $\phi(x)$ is the probability density function of the variable x. Pearson stated a theorem, which he attributed to W. F. Sheppard, that the average differences between successive individuals are the successive terms in the binomial expansion of

$$\int_{-\infty}^{\infty}\{\alpha+(1-\alpha)\}^{n}dx. \tag{2}$$

In a footnote, Pearson remarked, "Clearly a knowledge of the average difference in character of two adjacent individuals involves also a knowledge of the average difference in character between any two individuals". For a symmetric population, such knowledge also involves a knowledge of the expected values of all the order statistics, since for odd sample sizes $n=2k+1$, where k is an integer, $E(x_{k+1})=\mu$ (the population mean), while for even sample sizes $n=2k$, $\frac{1}{2}[E(x_k)+E(x_{k+1})]=\mu$.

Irwin (1925) gave expressions for the mean difference between the pth and qth individuals in order of magnitude and for the moments of the frequency distribution of differences between consecutive individuals. Tippett (1925) published a seven-decimal-place table of the probability integral of the largest individual in samples of size n from a normal population for $n=3$, 5, 10 and $x=-2.6(0.2)5.8$; $n=20$, 30, 50 and $x=-0.1(0.1)6.0$; $n=100(100)1000$ and $x=1.0(0.1)6.5$. The same paper included a five-decimal-place table of the mean range of samples of size $n=2(1)1000$ from a normal population. Since the expected values of the largest and smallest individuals are numerically equal, but opposite in sign, and since their difference is the expected value of the range, the expectation of their absolute value is equal to half the expected value of the range, and hence can be obtained from Tippett's table. The expected values of normal order statistics other than the first and last were not computed until somewhat later.

Karl Pearson and Margaret V. Pearson (1931) obtained an expansion in Taylor series for $E(x_i)$, accurate to 5 or 6 decimal places for $|E(x_i)|$ not too large (say <1). Fisher and Yates (1938, Table XX) published a two-decimal-place table of the expected values of all normal order statistics for samples of size $n=2(1)50$. Their values are correct except for four errors of a unit in the last place, due to rounding. Hastings, Mosteller, Tukey and Winsor (1947) published a five-decimal-place table of the means and standard deviations of all order statistics for samples of size $n=2(1)10$ from a normal population, also from a uniform population and from a selected long-tailed population. Their values for the means of normal order statistics are correct except for $n=10$, where there are errors of from 1 to 7 units in the last place.

*Earlier versions of this material were published by Harter (1960, 1961).

Wilks (1948) published an expository paper summarizing work on order statistics up to that time and listing 90 references.

Godwin (1949a) published a table of the expected values of rank differences in normal samples, to 10 decimal places for $n=2$; 9 decimal places for $n=3, 4$; 8 decimal places for $n=5$; 7 decimal places for $n=6, 7$; 6 decimal places for $n=8$; and 5 decimal places for $n=9, 10$. Godwin (1949b) also published a seven-decimal-place table of the means and standard deviations of all normal order statistics for samples of size $n=2(1)10$. His values for the means of the first order statistics are accurate to 7 decimal places, and his other values are probably equally accurate, since they were computed by the same method. Cadwell (1953) published a table of moments (mean, variance, β_1 and β_2) and selected percentage points of the first quasi-range for samples of size $n=10(1)30$. His values of the means are correct except for one error of a unit in the last place, due to rounding. E. S. Pearson and Hartley (1954, Table 28) published a table of expected values of normal order statistics, to 3 decimal places for $n=2(1)20$ and to 2 decimal places for $n=21(1)26(2)50$; values for $n=2(1)10$ were compiled from Godwin's table, those for $n=11(1)20$ were freshly computed by Jean H. Thompson, while those for $n>20$ were taken from the table by Fisher and Yates. These values are correct except for three errors of a unit in the last place, due to rounding. Harter (1959) published a 6-decimal-place table (accurate to within a unit in the last place) of the expected values of the range and of the first 8 quasi-ranges for samples of size $n=2(1)100$ taken from a normal population. This table is included as Table A1 of the present volume and the related theory is given in Chapter I, Section 1. By dividing these values by two, the expectations of the absolute values of the nine largest and the nine smallest normal deviates can be obtained.

Federer (1951) used a somewhat different approach than did most of the aforementioned authors, who depended largely on numerical integration for the determination of tabular values. Federer made use of the recurrence formula

$$E(x_{m,i+1})=\frac{1}{i}\{mE(x_{m-1,i})-(m-i)E(x_{m,i})\}, \tag{3}$$

where $x_{m,i}$ is the ith largest deviate from a sample of size m. Starting from Tippett's table of expected values of the range, Federer computed 3-decimal-place values of the three largest normal deviates for samples of size $n=41(1)200$ and 2-decimal-place values of the fourth largest normal deviate for $n=41(1)200$ and of the fifth largest normal deviate for $n=41(1)100$. Because of loss of accuracy with repeated application of the recurrence formula, some of Federer's values are in error by from 1 to 3 units in the last place, and it is evident that the form of the recurrence formula given by Equation (3) is of little value in computation. The author is indebted to E. S. Pearson for pointing out that, if written in the form

$$E(x_{m-1,i})=\frac{1}{m}\{iE(x_{m,i+1})+(m-i)E(x_{m,i})\}, \tag{4}$$

the recurrence formula can be used for working *downwards* with no serious accumulation of rounding errors. Similar recurrence formulas for the variance and covariance of order statistics have been obtained by Govindarajulu (1959).

1.2. METHOD OF COMPUTATION

The expected value of the kth largest observation in a sample of size n from a standard normal population (mean zero and variance one) is given by the equation

$$E(x_{k|n})=\frac{n!}{(n-k)!(k-1)!}\int_{-\infty}^{\infty}x\left[\frac{1}{2}-\Phi(x)\right]^{k-1}\left[\frac{1}{2}+\Phi(x)\right]^{n-k}\phi(x)dx. \tag{5}$$

where $\phi(x)=(2\pi)^{-1/2}e^{-x^2/2}$ and $\Phi(x)=\int_0^x\phi(x)dx$. The expected value of the kth smallest observation is given by the same expression preceded by a minus sign, so that for a given value of n it is necessary only

to compute the expected values for $k = 1(1)[n/2]$. This was done by numerical integration on the Univac Scientific (ERA 1103A) computer, for $n = 2(1)100$ and for values of n, none of whose prime factors exceeds seven, up through $n = 400$. Values of $\log_{10} n!$ for $n = 1(1)400$ from a table by Pearson and Hartley (1954, Table 51) and values of $\phi(x) = \phi(-x)$ for $x = 0(0.05)7.60$, $2\Phi(x) = -2\Phi(-x)$ for $x = 0(0.05)5.95$, and $1 - 2\Phi(x) = 1 + 2\Phi(-x)$ for $x = 6.00\ (0.05)7.60$ from tables by the National Bureau of Standards (1953, Tables I and II) were read into the computer. For each pair of values of n and k, the product $I(n, k, x)$ of the multiplicative constant and the integrand in Equation (5) was determined for $x = -7.60\ (0.05)7.60$ by computing $e^{\log_e I(n, k, x)}$, where

$$\log_e I(n, k, x) = \log_e n! - \log_e (n-k)! - \log_e (k-1)! + \log_e x + (k-1) \log_e \left[\frac{1}{2} - \Phi(x) \right] + (n-k) \log_e \left[\frac{1}{2} + \Phi(x) \right] + \log_e \phi(x). \qquad (6)$$

Fixed-point binary arithmetic was used, and the numbers were scaled so as to retain as much accuracy as possible. Since $I(n, k, x)$ is zero (to the number of places carried in the computer) for all values of n and k when $|x| > 7.60$, the resulting value of $E(x_{k|n})$, obtained by using either the trapezoidal rule or one which assigns special weights to the first seven and the last seven values of the integrand (all zero in this case), is found by summing $I(n, k, x)$ for $x = -7.60(h)7.60$ and multiplying by the interval, h. Results were computed and printed out (to seven decimal places) for $h = 0.05$ and $h = 0.10$, and agreement is sufficiently close to guarantee that the values of $E(x_{k|n})$ for $h = 0.05$ are accurate to within a unit in the fifth decimal place. Accordingly, the values for $h = 0.05$ were rounded to five decimal places, and the five-decimal-place values were punched on cards and listed on the IBM 407 tabulator. The results are reproduced as Table C1A.

1.3. BLOM'S APPROXIMATION

In 1954 Blom became interested in the problem of plotting points on normal probability paper and, after reading a paper published by Chernoff and Lieberman (1954), in the related problem of estimating parameters by means of linear functions of order statistics, Blom (1958) proposed approximating the ith normal order statistic (ith smallest normal deviate) for a sample of size n by means of the relation

$$E(x_i) = \Phi^{-1}\left(\frac{i - \alpha}{n - 2\alpha + 1} \right), \qquad (7)$$

where $\Phi(x) = \int_{-\infty}^{x} \phi(x)dx$, with $\phi(x) = (2\pi)^{-1/2} e^{-x^2/2}$. Note that $\Phi(x)$ is defined differently here than in subsection 1.2. It should be mentioned that there has been an argument of long standing between advocates of the approximations corresponding to $\alpha = 0$ and $\alpha = 1/2$. However, neither is optimal. Blom tabulated the value of α required to yield the correct value of $E(x_i)$ for $i = 1(1)[n/2]$ when $n = 2(2)10(5)20$. The values of α increase as n increases, the lowest value being 0.330 for $n = 2$, $i = 1$. For a given n, α is least for $i = 1$, rises quickly to a peak for a relatively small value of i, and then drops off slowly; as an example, for $n = 20$, $\alpha = 0.374$ for $i = 1$, the peak value of α is 0.391 for $i = 3$, and α drops to 0.386 for $i = 8, 9, 10$. Blom conjectured that α always lies in the interval (0.33, 0.50). He suggested the use of $\alpha = 3/8$ as a compromise value.

If one solves Equation (7) for the value of α required to yield the correct value of $E(x_i)$ for given i and n, one obtains

$$\alpha_{i,n} = \frac{i - (n+1)\Phi[E(x_i)]}{1 - 2\Phi[E(x_i)]} \qquad (8)$$

Values of $\alpha_{i,n}$ for $i = 1(1)[n/2]$ when $n = 25, 50, 100, 200, 400$ have been computed on the Burroughs $E101$–3 computer, and the results, rounded to three decimal places, are shown in Table C1B. For brevity, results have been given only for values of i which are multiples of 5 for i between 25 and 100 and multiples of 10

for i between 100 and 200. A glance at the values in Table II is sufficient to show that the compromise value of 3/8 for α proposed by Blom *is too low except for small* values of n. It is possible, however, to do a fairly good job of estimating $E(x_i)$ by choosing one or two compromise values of α for each n. One can choose a single compromise value, α_n, for each n, to be used for all values of i, and simultaneously insure that the error in $E(x_i)$ does not exceed four units in the third decimal place. If one uses $\alpha_{1,n}$ to estimate $E(x_1)$ and $\alpha_{2,n}$ to estimate $E(x_i)$ for $i \neq 1$, the error in $E(x_i)$ will not exceed one unit in the third decimal place. Values of α_n, $\alpha_{1,n}$ and $\alpha_{2,n}$ are given in Table C1C for $n = 2(2)10(5)25, 50, 100, 200, 400$, along with regression equations to be used for intermediate values of n. Values of α found by substituting tabular values of n in these regression equations do not differ from the corresponding tabular values of α by more than two units in the third decimal place, and this error in α does not increase the error in $E(x_i)$ by more than one unit in the third decimal place. There is reason to believe that results for intermediate values of n will be equally good, but use of these equations for $n > 400$ is emphatically discouraged. Thus, if one wishes to interpolate for intermediate values of n, the maximum errors are five units in the third decimal place for the approximation based on a single compromise value of α and two units in the third decimal place for the approximation based on two compromise values of α. These errors compare with a maximum error of between one and two units in the third decimal place for linear interpolation between successive values of n for a given $i(k)$ in Table C1A. Comparison of the maximum errors might lead to the conclusion that interpolation in Table C1A is always more accurate than interpolation using Blom's approximation. This would be erroneous, since the maximum error for the former occurs for large values of i (near $n/2$), while the maximum error for the latter occurs for small values of i. Interpolation using Blom's approximation for large values of i, especially when the desired value of n lies about midway between widely separated successive tabular values of n (for example, when $n = 232$), and interpolation in Table C1A otherwise will limit the error to no more than a unit in the third decimal place. If more accurate values are required, they should be computed in the same way that Table C1A was computed, as should values for $n > 400$.

1.4. APPLICATIONS

Pearson and Hartley (1954, p. 56) have given two examples of applications of tables of expected values of normal order statistics. The first of these is concerned with estimating the weight of the five heaviest of 30 lambs at age $2\frac{1}{2}$ months, given the mean and standard deviation of the population, which is assumed to be normal. The second deals with the use of order statistics in estimating the population standard deviation. Pearson and Hartley and also Fisher and Yates (1938, Table XX, footnote) mention the use of expected values of normal order statistics in the analysis of variance of ranked data. The potential use of expected values of normal order statistics for transformation to standard normal scores *preliminary to the analysis* of variance was the principle motivation for the present study. In cases where only the rank of the observations is known, there is no reasonable alternative to transformation to standard normal scores, but the usefulness of this method is not restricted to such cases. When the data are known to have come from a population which does not satisfy the assumptions underlying the analysis of variance, of which normality is one, or when the data themselves give a strong indication to that effect, the experimenter seeks a transformation which will minimize or eliminate departures from the assumptions. One transformation which should be considered is the transformation to standard normal scores, and a preliminary investigation has shown that this transformation has some very desirable properties; in some cases it reduces both non-additivity and non-homogeneity of variance to lower levels than does any transformation of the form $(x+c)^p$. It has, of course, the obvious disadvantage of not being reversible, except when the raw data are ranks.

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2. OTHER POPULATIONS*

2.1. INTRODUCTION

After the author (1960, 1961) published the table of expected values of normal order statistics discussed in Section 1 of this chapter and included as Table C1 of this volume, he received several inquiries as to the availability of similar tables for samples from populations other than the normal. Upon investigation he found that, while mathematical expressions were known for the expected values of order statistics of samples from many other populations, few of them had been tabulated. In some cases, the absence of published tables may be attributed to the fact that the mathematical expressions are so simple that they do not warrant tabulation. This is certainly true in the case of the rectangular population between the limits 0 and 1, for which the expected value of the Mth order statistic of a sample of size N is simply $M/(N+1)$. Some may believe it to be true also for the exponential population, for which the results may be obtained by summing reciprocals of integers, but the author does not hold to this view. In other cases, such as the Weibull and Gamma populations, the lack of tables may have been due to the formidability of the task of computing them. Whatever the reasons for the gap, the author believed that it should be bridged and succeeded in doing so for the exponential, Weibull, and Gamma populations.

2.2. MATHEMATICAL FORMULATIONS AND METHODS OF COMPUTATION

2.2.1. EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

The probability density function of the one-parameter negative exponential population with scale parameter θ is given by

$$f(x;\,\theta) = e^{-x/\theta}/\theta \qquad (0 \leqslant x < \infty). \tag{1}$$

(When the location parameter is identically zero, as in this case, it is not counted as a parameter.) Epstein and Sobel (1953) have shown that the expected value of the Mth order statistic of a sample of size N from this population is given by

$$E(x_{M,N};\,\theta) = \theta \sum_{j=1}^{M} 1/(N-j+1). \tag{2}$$

This expression has been tabulated, without loss of generality, for $\theta = 1$; if $\theta \neq 1$, the expected values can be computed by multiplying the tabular values, as given in Table C2, by θ. The values in Table C2 were computed from Equation (2) with $\theta = 1$. The computations were performed on the IBM 7094 computer. The program was written in FORTRAN. Double-precision arithmetic was used to avoid any possible loss of accuracy. The results were rounded to five decimal places and punched on IBM cards, and the values on the cards were checked by differencing. Table C2 was reproduced from a listing of the cards on the IBM 407 tabulator, and was checked visually against the values differenced.

2.2.2. EXPECTED VALUES OF WEIBULL ORDER STATISTICS

The probability density function of the Weibull population with location parameter 0, scale parameter θ, and shape parameter K is given by

$$f(x;\,\theta,\,K) = (K/\theta)(x/\theta)^{K-1}e^{-(x/\theta)^K} \qquad (x \geqslant 0;\ \theta,\,K > 0). \tag{3}$$

Lieblein (1955), Leone, Rutenberg, and Topp (1960), and Quayle (1963) have derived mathematical expressions, equivalent but differing slightly in form, for the expected value of the Mth order statistic of a sample of size N from the population whose probability density function is given by Equation (3). [Leone, Rutenberg,

*An earlier version of this material was published by Harter (1964b).

and Topp have also computed the expected values of the middle order statistics of samples of size $N = 5(2)11$ for $K = 1.5(0.5)5$, but unfortunately their results, which are given to 8 decimal places, are in error by as much as a unit in the fourth decimal place.] The present computations are based upon Quayle's expression which, with a slight change in notation, becomes

$$E(x_{M,N};\ \theta,\ K) = \theta N \binom{N-1}{M-1} \Gamma\left(1+\frac{1}{K}\right) \sum_{j=0}^{M-1} \binom{M-1}{j} \frac{(-1)^{M+j-1}}{(N-j)^{1+1/K}}. \tag{4}$$

The expression given by Equation (4) was evaluated on the IBM 1620 computer for $N = 40$, $M = 1(1)40$, $\theta = 1$, and $K = 0.5(0.5)4(1)8$. The FORTRAN program used was a modification of one written by Quayle. In order to prevent loss of accuracy because of the heavy cancellation which occurs in summing the finite series in Equation (4), which is apparently the computational pitfall that Leone, Rutenberg, and Topp failed to avoid, 28 decimal digits were carried in the computations. The results were rounded to 12 decimal places (a maximum of 14 significant digits) before being punched on IBM cards. These cards were used as input to a second IBM 1620 FORTRAN program which computed $E(x_{M,N};\ \theta,\ K)$ for $N = 39(-1)1$, $M = 1(1)N$, $\theta = 1$, and the above-mentioned values of K by means of the recurrence relation

$$E(x_{M,N}) = [ME(x_{M+1,N+1}) + (N-M+1)E(x_{M,N+1})]/(N+1). \tag{5}$$

In this recurrence relation, derived by Henry E. Fettis, the arguments θ and K of the E's have been omitted, it being understood that they remain fixed. While this downward recurrence relation is remarkably stable, in contrast with the instability of the corresponding upward recurrence relation, 11 decimal digits were carried in the computations to prevent the accumulation of round-off errors. The results were then rounded to 5 decimal places (a maximum of 7 significant digits) before being punched on IBM cards. The values on the cards were checked by differencing, also by summing over all values of M for each combination of N and K and verifying that the sum is, to within the allowable rounding error, $N\Gamma(1+1/K)$. [The sum of the expected values is the expected value of the sum or N times the mean, which is, as will be shown in subsection 2.2.4, $\Gamma(1+1/K)$.] Table C3 was reproduced from a listing of the cards on the IBM 407 tabulator, and was checked visually against the values differenced.

2.2.3. EXPECTED VALUES OF GAMMA ORDER STATISTICS

The probability density function of the Gamma population with location parameter 0, scale parameter θ, and shape parameter α is given by

$$f(x;\ \theta,\ \alpha) = [1/\theta\Gamma(\alpha)]\ (x/\theta)^{\alpha-1}e^{-x/\theta} \qquad (x \geq 0;\ \theta,\ \alpha > 0). \tag{6}$$

Gupta (1960, 1962) and Karns (1963) have derived mathematical expressions for the expected value of the Mth order statistic of a sample of size N from the population whose probability density function is given by Equation (6). [Gupta has also computed the expected values for $M = 1(1)N$, $N = 1(1)10$ as well as $M = 1$, $N = 11(1)15$ when $\alpha = 1(1)5$. Although the results are given in his 1960 paper to six digits, some of them are in error by as much as 6 units in the fifth digit, probably because of his reliance on a recurrence relation with alternating signs, which can result in severe loss of accuracy due to heavy cancellation. In his 1962 paper the results have been rounded to three decimal places (a maximum of four significant digits), perhaps indicating that he had some doubt as to the accuracy in the fourth and fifth decimal places of the table in the earlier paper.] The present computations are based upon Karns' expression which, with a slight change in notation, becomes

$$E(x_{M,N};\ \theta,\ \alpha) = \frac{\theta N}{\Gamma(\alpha)} \binom{N-1}{M-1} \int_0^\infty \left[\frac{\Gamma(\alpha;\ z)}{\Gamma(\alpha)}\right]^{M-1} \left[1-\frac{\Gamma(\alpha;\ z)}{\Gamma(\alpha)}\right]^{N-M} z^\alpha e^{-z} dz, \tag{7}$$

where $\Gamma(\alpha;\ z)$ is the incomplete Gamma function defined by

$$\Gamma(\alpha;\ z) = \int_0^z t^{\alpha-1}e^{-t}dt, \tag{8}$$

and $\Gamma(\alpha; z)/\Gamma(\alpha)$ is the incomplete Gamma-function ratio, which has been extensively tabulated by Pearson (1922) and by Harter (1964a). The expression given by Equation (7) was evaluated by numerical integration on the IBM 7094 computer for $M = 1(1)N$, $N = 1(1)40$, $\theta = 1$, and $\alpha = 0.5(0.5)4$. The FORTRAN program used was a modification of one written by Karns. Eight-decimal-place values, from a preliminary version of the nine-decimal-place table by Harter (1964a, Table 1), of the incomplete Gamma-function ratio $I(u, p) = \Gamma(\alpha; z)/\Gamma(\alpha)$, where $p = \alpha - 1$ and $u = z/\sqrt{\alpha}$, were used as input to the program. It was found that the tabular interval of 0.1 in u was too large to give good results for the numerical integration, so that it was necessary to subtabulate. The subtabulation was performed by Aitken's method of interpolation, but results were not satisfactory for small values of u. Hence for $u \leq 1.5$, it was necessary to resort to use of a table by Pearson (1922, Table III) of the logarithms of the auxiliary function $I'(u, p) = I(u, p)/u^{p+1}$, which is readily interpolable. The interpolated values of $I(u, p)$ were found by multiplying the antilogarithms of the interpolated values of $\log I'(u, p)$ by u^{p+1}. In evaluating the integral in Equation (7) by numerical integration, it was necessary to use a smaller interval for $u < 1.5 (z < 1.5\sqrt{\alpha})$ than for $u > 1.5 (z > 1.5\sqrt{\alpha})$. Therefore the integral from 0 to ∞ was expressed as the sum of the integrals from 0 to $1.5\sqrt{\alpha}$ and from $1.5\sqrt{\alpha}$ to ∞, and each of the latter two integrals was evaluated by use of a seven-point formula, with the intervals taken small enough to insure that the sum of the two truncation errors would not produce an error in excess of 5×10^{-6} in $E(x_{M, N}; \theta, \alpha)$. The computations were performed in double precision to avoid any possible loss of accuracy, but the results were rounded to five decimal places (a maximum of six significant digits) before being punched on IBM cards. The values on the cards were checked by differencing, also by summing over all values of M for each combination of N and α and verifying that the sum is, to within the allowable rounding error, $N\alpha$. [The sum of the expected values is the expected value of the sum or N times the mean, which is α, as will be shown in subsection 2.2.4.] A further check was made by use of the recurrence relation given by Equation (5), which was derived by Fettis for the Weibull population, but which can be shown to hold also for the Gamma population. For $\alpha = 0.5(0.5)4$ and $M = 1(1)N$, results were computed for each value of N from 1 to 39, by use of Equation (5) and the values for $N+1$ given on the cards. All values computed in this manner agreed with the corresponding values on the cards to within a unit in the fifth decimal place. [The recurrence formula was not used as the basic computing formula for $N < 40$, as in the case of the Weibull population, because of the impossibility of obtaining, from available tables of the incomplete Gamma-function ratio, values for $N = 40$ which are sufficiently accurate to guarantee that round-off errors will not accumulate above the allowable limits.] Table C4 was reproduced from a listing of the cards on the IBM 407 tabulator, and was checked visually against the values differenced.

When Table C4 was first published in an Air Force technical report [Harter (1964b)] the author believed that all tabular values were accurate to within a unit in the fifth decimal place. Since that time, however, tables of the first four moments of Gamma order statistics for sample sizes up through $N = 16$ have been published by Breiter and Krishnaiah (1967). The values for the cases that are common to the two tables show good agreement, except for the means of the first order statistics when the shape parameter, α, is equal to 0.5, for which there are discrepancies as large as two units in the fifth decimal place. Moreover, the discrepancy increases with the sample size, so that one would expect it to be even larger for sample sizes greater than 16. The author rechecked the tabular values for $N < 16$, with $\alpha = 0.5$, by numerical integration in equation (7), this time making use of a double-precision computer subroutine, based on a series expansion derived by Harter (1967), to calculate the required values of the incomplete Gamma-function ratio instead of interpolating in the nine-decimal-place table by Harter (1964a). He found that the values given by Breiter and Krishnaiah are correct, so he carried the computations up through $N = 40$ and, as a result, corrections as large as five units in the fifth decimal place were found to be necessary when $M = 1$ and $\alpha = 0.5$. The corrected values are given in Table C4.

2.2.4. MOMENTS OF EXPONENTIAL, WEIBULL, AND GAMMA POPULATIONS

The mean μ, the variance σ^2 (the square of the standard deviation σ), the skewness α_3, and the kurtosis α_4 of the distribution of a random variable X having probability density function $f(x)$ are given by

$$\mu = E(x), \tag{9}$$

$$\sigma^2 = E(x^2) - E^2(x), \tag{10}$$

$$\alpha_3 = [E(x^3) - 3E(x^2)E(x) + 2E^3(x)]/\sigma^3, \tag{11}$$

and

$$\alpha_4 = [E(x^4) - 4E(x^3)E(x) + 6E(x^2)E^2(x) - 3E^4(x)]/\sigma^4, \tag{12}$$

where the expected value of the rth power of x is defined by

$$E(x^r) = \int_a^b x^r f(x)dx, \tag{13}$$

a and b being the lower and upper limits of the range of x. For the one-parameter negative exponential population with parameter θ, which has the probability density function given by Equation (1), we find that $E(x^r) = \theta^r\Gamma(r+1) = \theta^r r!$, whence $\mu = \theta$, $\sigma^2 = \theta^2$, $\alpha_3 = 2$, $\alpha_4 = 9$. Thus the single parameter, θ, is both the mean and the standard deviation. For the Weibull population with location parameter 0, scale parameter θ, and shape parameter K, which has the probability density function given by Equation (3), we find that $E(x^r) = \theta^r\Gamma(1 + r/K)$, whence

$$\mu = \theta\Gamma(1 + 1/K), \tag{14}$$

$$\sigma^2 = \theta^2[\Gamma(1 + 2/K) - \Gamma^2(1 + 1/K)], \tag{15}$$

$$\alpha_3 = \frac{\Gamma(1 + 3/K) - 3\Gamma(1 + 2/K)\Gamma(1 + 1/K) + 2\Gamma^3(1 + 1/K)}{[\Gamma(1 + 2/K) - \Gamma^2(1 + 1/K)]^{3/2}}, \tag{16}$$

and

$$\alpha_4 = \frac{\Gamma(1 + 4/K) - 4\Gamma(1 + 3/K)\Gamma(1 + 1/K) + 6\Gamma(1 + 2/K)\Gamma^2(1 + 1/K) - 3\Gamma^4(1 + 1/K)}{[\Gamma(1 + 2/K) - \Gamma^2(1 + 1/K)]^2}. \tag{17}$$

For the Gamma population with location parameter 0, scale parameter θ, and shape parameter α, which has the probability density function given by Equation (6), we find that $E(x^r) = \theta^r\Gamma(r+\alpha)/\Gamma(\alpha) = \theta^r\alpha(\alpha+1) \ldots (\alpha+r-1)$, whence

$$\mu = \theta\alpha, \tag{18}$$

$$\sigma^2 = \theta^2\alpha, \tag{19}$$

$$\alpha_3 = 2/\sqrt{\alpha}, \tag{20}$$

and

$$\alpha_4 = 3(\alpha + 2)/\alpha. \tag{21}$$

For $\theta = 1$, the mean, variance, skewness, and kurtosis of the Weibull population with scale parameter $K = 0.5(0.5)4(1)8$ and of the Gamma population with scale parameter $\alpha = 0.5(0.5)4$ were computed, accurate to eight decimal places, from Equations (14)–(17) and (18)–(21), respectively. All computations were performed on the IBM 1620 computer with FORTRAN programming. In the case of the Weibull population, Stirling's approximation to the Gamma function was used, a sufficient number of terms being taken into account to insure the required accuracy. The results for exponential, Weibull, and Gamma populations were punched on IBM cards, and Table C5 was reproduced from a listing of the cards on the IBM 407 tabulator.

2.3. USES OF TABLES

Before proceeding to a discussion of the specific uses of Tables C2–C5 described in this section, it is appropriate to make some general remarks about the usefulness of the exponential population and of the Weibull and Gamma populations, both of which are generalizations of the exponential. All three of these populations have been widely used in life testing and reliability studies. The exponential population, being the simplest, has probably been used most, sometimes in situations where it is not appropriate. This population has the property of constant hazard rate; that is, the conditional probability that a device whose life is exponentially distributed will fail in the time interval $(t, t + \Delta t)$, given that it has not failed by time t, is inde-

pendent of the length of time t that it has already been in service. Obviously, there are many devices which do not have constant hazard rate, but a surprising number of electronic and other devices do, at least over a substantial portion of the life cycle between the period of high infant mortality (decreasing hazard rate) and the period when wearout failures have begun to occur (increasing hazard rate). The distribution of the time between failures of complex equipment which has been in service for a substantial period of time, during which components that have failed have been replaced by good ones, so that the ages of the components are thoroughly mixed, also closely approximates the exponential distribution, even though the lives of the individual components may not. Nevertheless, there are many cases in which life is not exponentially distributed; in a substantial number of these, the life distributions can be adequately approximated by Weibull or Gamma distributions with suitable shape parameters. These two distributions have decreasing, constant, or increasing failure rates according as their shape parameters are less than, equal to, or greater than 1. The role of various populations in life testing, reliability, and renewal theory has been discussed in papers by Davis (1952), Epstein and Sobel (1953, 1954), Epstein (1954, 1960a, b), Birnbaum and Saunders (1958), Drenick (1960), and Gupta and Groll (1961), and in a number of other papers referred to in these.

The Weibull population, introduced by Weibull (1939) in connection with a statistical theory of the strength of materials, has proved to be quite a useful and versatile one, with characteristics depending upon the value of the shape parameter K. It has as special cases the exponential population ($K = 1$) and the Rayleigh population ($K = 2$). It is positively skewed for $K < 3.6$, almost normal (slightly platykurtic) for $K = 3.6$, and negatively skewed for $K > 3.6$, as can be seen from Table C5. As $K \to \infty$, it approaches the "spike" population, in which all values are concentrated at a single point. The Gamma population is also quite versatile, with properties dependent upon the value of the shape parameter α. When $\alpha = 1$, the Gamma variable is exponentially distributed. Whatever the value of α, the Gamma variable is equivalent to one-half the chi-square variable with degrees of freedom 2α, thus making the Gamma population especially useful for values of α which are integral multiples of one-half, corresponding to integral numbers of degrees of freedom for χ^2. The Gamma distribution is positively skewed for finite values of α, but approaches normality as $\alpha \to \infty$, as can be seen from Equations (20) and (21) and Table C5.

The principal use of expected values of order statistics is as plotting positions on graphs constructed to test graphically the hypothesis that a particular set of data have come from a specified population, and if the hypothesis is accepted, to estimate the parameters of the population. For some populations (especially normal, exponential, and extreme value), special probability graph papers have been produced with the scale linear in one direction and based upon percentiles of the particular population in the other, so that data which have come from the population in question tend, when ordered and plotted against their cumulative probabilities, to fall along a straight line. For the Weibull and Gamma populations, however, probability papers would have to be produced with a different non-linear scale for each value of the shape parameter. Therefore the most practical solution for such populations is to plot the data on ordinary linear-by-linear graph paper, using the expected values of order statistics of samples of the given size from the population in question as plotting positions, or in the absence of knowledge of these exact plotting positions, using one of several approximations that have been proposed. The question of plotting positions, in general and for specific populations, has been discussed by Chernoff and Lieberman (1954, 1956), Blom (1958), Kimball (1960), and Harter (1960, 1961), to name but a few. [See also subsection 1.3 of this chapter.]

Now consider an example of the use of the expected values of Weibull order statistics given in Table C3. Suppose that 20 components are subjected to a life test and that the times to failure in hours are as follows:

154	770	899	1044	1294
419	845	953	1059	1678
590	848	954	1126	1831
603	891	982	1127	1847

Let it be required to test graphically the hypothesis that the life of components of this type follows a Weibull distribution, and if the hypothesis is accepted, to estimate the parameters of the distribution. In Figure 2, the lives of the components included in the above sample have been plotted as the ordinates of three sets

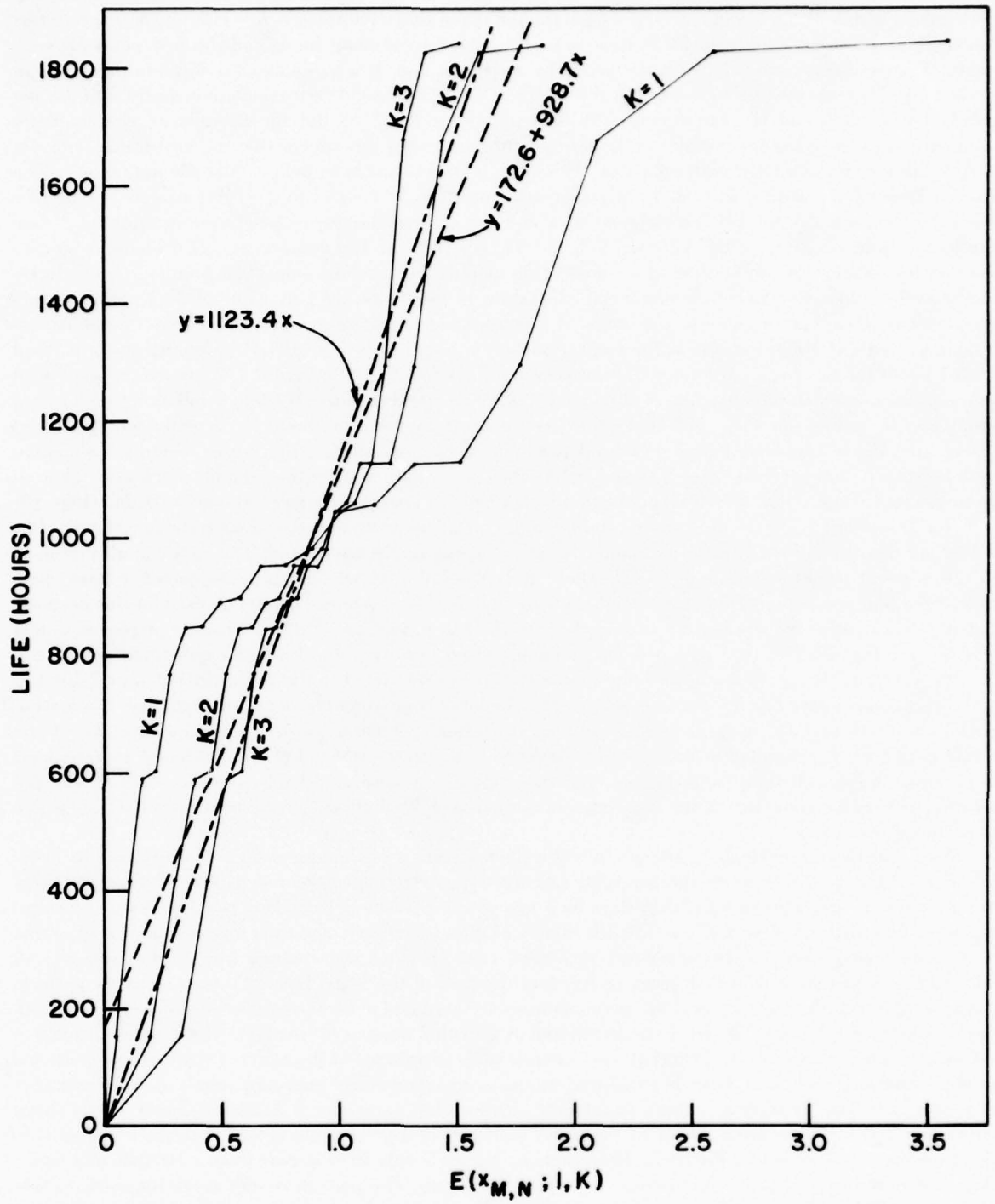

FIG. 2. GRAPHICAL TEST OF HYPOTHESIS THAT LIFE TEST DATA HAVE COME FROM WEIBULL POPULATION AND ESTIMATION OF PARAMETERS, USING EXPECTED VALUES OF ORDER STATISTICS

of points whose abscissas are the expected values of order statistics for samples of size 20 from Weibull populations with location parameter 0, scale parameter 1, and shape parameters $K = 1, 2,$ and 3, respectively. Successive points for each value of K have been connected by straight lines, and the first point for each value of K has been connected with the origin by a straight line. If a parabola were fitted to the points in each group, it is obvious at a glance that the parabola for $K = 1$ would be concave downward and the parabola for $K = 3$ would be concave upward. The points for $K = 2$ exhibit the irregularity characteristic of such groups of points for samples no larger than 20, but it does not appear that the best-fitting parabola would differ materially from a straight line. Therefore it is reasonable to believe that the data have arisen from a Weibull population with shape parameter K approximately equal to 2. If the expected value of a Weibull order statistic for $K = 2$ is denoted by x and the correspondingly ordered sample value by y, then the least squares regression line is found to be $y = 172.6 + 928.7\ x$. The y-intercept, 172.6 hours, is an estimate of the location parameter (the lower limit of the population), and the slope, 928.7 hours, is an estimate of the scale parameter. Since one of the sample values is 154 hours, the true value of the location parameter must be less than or equal to 154 hours. If it is assumed to be zero, so that the regression line is constrained to pass through the origin, the regression line is found to be $y = 1123.4\ x$, yielding an estimate of 1123.4 hours for the scale parameter. Both regression lines are shown in Figure 2. Actually, the data used in the problem are fictitious; they were obtained by random sampling from a Weibull population with location parameter 0, scale parameter 1000, and shape parameter 2, by use of a Monte Carlo technique. More precisely, the Monte Carlo technique was used to obtain a random sample from an exponential population with location parameter 0 and scale parameter 100; then the square roots of the sample values were taken so as to obtain a sample from a Weibull population with location parameter 0, scale parameter 10, and shape parameter 2; and finally these results were multiplied by 100. This method is based upon the fact that if x has a Weibull distribution with shape parameter K, x^K is exponentially distributed. This fact can also be used to test whether or not a sample of size N, where $40 < N \leq 120$, may reasonably be supposed to have come from a Weibull population. Table C3 extends only through $N = 40$ and hence cannot be used for this purpose, but the data can be transformed by raising them to the Kth power, and Table C2 can be employed to test whether the transformed data may reasonably be supposed to have come from an exponential population. Several values of K can be tried, and the choice of K is not restricted to the values included in Table C3. If the result, for some value $K = K_0$, is a set of points which fall approximately along a straight line, it is reasonable to suppose that the original data came from a Weibull population with shape parameter K_0. If the shape parameter is estimated to be K_0, the location and scale parameters of the distribution of x^{K_0} (assumed to be exponential) can then be estimated, and the estimates transformed back to obtain estimates of the location and scale parameters of the population (assumed to be Weibull with shape parameter K_0) from which the original data came.

Next consider an example of the use of the expected values of Gamma order statistics given in Table C4. Hald (1952, p. 472) reports the logarithms of the permeabilities (measured in seconds) for 81 sheets of building material manufactured on 9 days by 3 machines, 3 sheets per machine per day. Before performing a two-way analysis of variance to test the effects of days, machines, and their interaction, it is desirable to test the homogeneity of the within-cell variances, each of which is computed from 3 observations and hence has associated with it 2 degrees of freedom. Instead of the usual Bartlett's test, one may perform a graphical test. If the logarithms of the permeabilities are assumed to be normal (permeabilities log-normal), the variances of subgroups of size 3 are distributed as χ^2 with 2 degrees of freedom, which is proportional to a Gamma variable with $\alpha = 1$. Therefore the ordered sums of squares of deviations (which are proportional to the within-cell variances) have been plotted as the ordinates and the expected values of order statistics of a sample of size 27 from a Gamma population with location parameter 0, scale parameter 1, and shape parameter 1 (which are proportional to the order statistics of a χ^2 population with 2 degrees of freedom) as abscissas of the points in Figure 3. The points in Figure 3 appear to depart from a straight line more than one would expect if the fluctuations were purely random. The pattern is very much the same as that obtained by Wilk, Gnanadesikan, and Huyett (1962, Figure 12) who, lacking a table of expected values of Gamma order statistics, obtained the abscissas for their points by interpolating in their table of percentage points of the Gamma distribution with shape parameter 1 to find the values corresponding to cumulative probabilities $(M - \frac{1}{2})/N$, where $M = 1(1)N$ and $N = 27$ in this example. The present method has two advan-

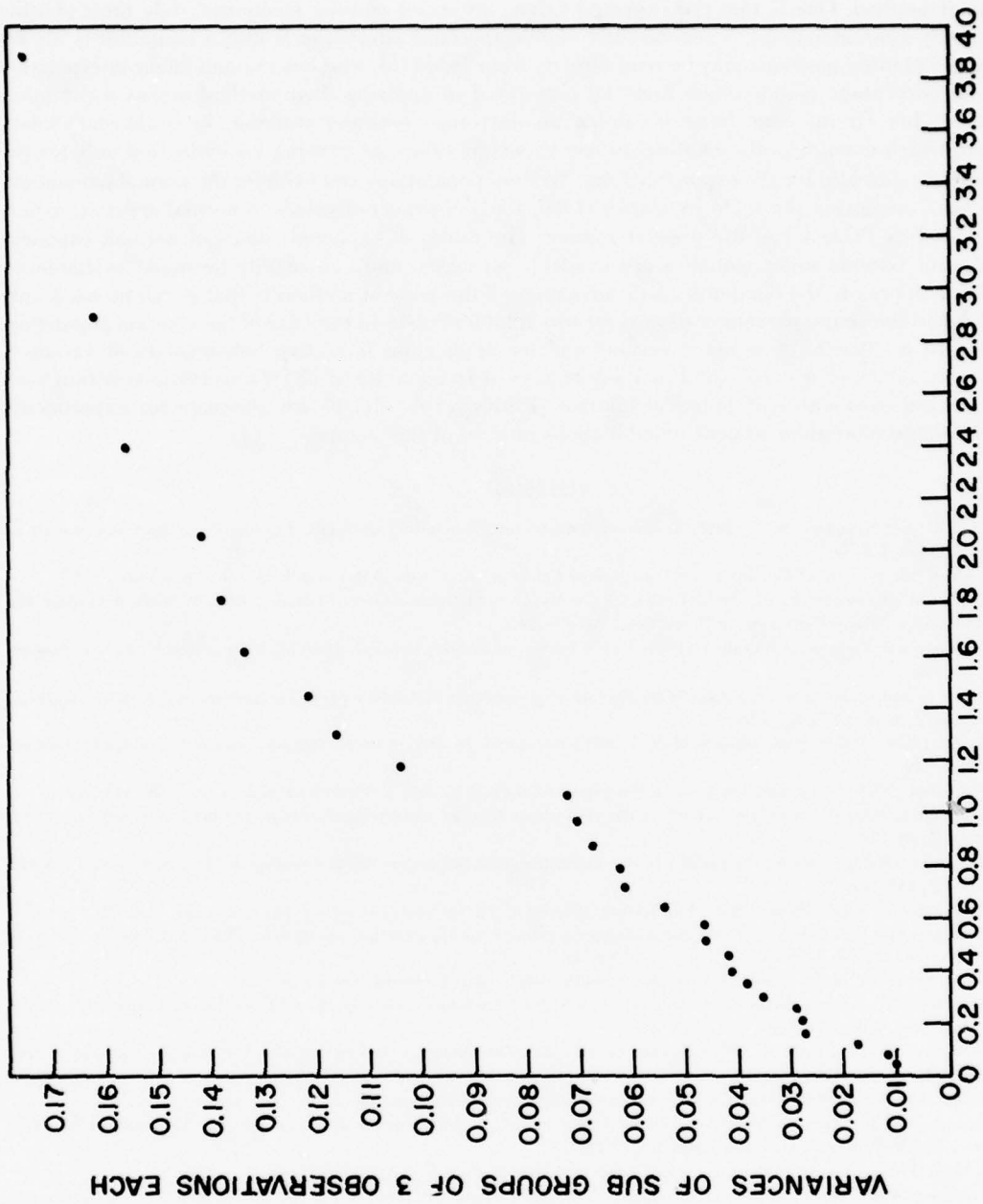

FIG. 3. GRAPHICAL TEST OF HOMOGENEITY OF VARIANCE, USING EXPECTED VALUES OF GAMMA ORDER STATISTICS

tages over their method. One is that the expected values are exact plotting positions, while their plotting positions are only approximations. A second (and more important) advantage is that a computer is not required, since the plotting positions may be read directly from Table C4, whereas the non-linear interpolation in the table of percentage points which must be performed in applying their method makes a computer almost indispensable. On the other hand, if one has an electronic computer available, he could easily adapt their program, which even does the plotting, to use expected values as plotting positions, not only for the Gamma population, but also for the exponential and Weibull populations and even for the normal population, in the latter case employing the table by Harter (1960, 1961) of expected values of normal order statistics, which is included as Table C1 of the present volume. The tables of expected values of normal, exponential, Weibull, and Gamma order statistics are available on cards, and can readily be made available on tape to facilitate access to the computer. A disadvantage of the present method is that it can be used only for values of N and the shape parameter (if any) for which tables exist. In the case of the Gamma population, the restriction to $\alpha = 0.5(0.5)4$ is not a serious one for application to testing homogeneity of variance, since the tabular values of α correspond to 1(1)8 degrees of freedom for χ^2 [2(1)9 observations within each cell], which covers most cases of practical interest. Tables for $N = 1(1)40$ are adequate for experiments which do not contain more than 40 cells (combinations of level of the factors).

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CHAPTER IV

ONE OR TWO ORDER STATISTICS FROM AN EXPONENTIAL POPULATION

1. POINT ESTIMATION OF ONE OR TWO PARAMETERS*

1.1. INTRODUCTION

Since the publication of papers by Mosteller (1946) and by Wilks (1948), a great deal of attention has been given to the use of order statistics in various statistical procedures, including the estimation of the parameters of various populations. Among the first to use this method for exponential populations was Halperin (1952). Since that time, Epstein and Sobel (1953), Sarhan (1954, 1955), Sarhan and Greenberg (1957, 1958), and Sarhan, Greenberg, and Ogawa (1960) have discussed various aspects of the use of order statistics in the estimation of the parameters of exponential populations. Most of these authors have considered best linear unbiased estimators based on all order statistics, or, in the case of truncated or censored samples, on all available order statistics. The last of the above papers includes simplified estimators based on two order statistics, with tables for samples of any size up through $n = 20$. This section deals with the computation of more accurate tables (Tables D1–D3) for samples of any size up through $n = 100$, not only for estimators based on two order statistics, but also, in the case of the one-parameter exponential population, for estimators based on one order statistic from a complete or a censored sample.

Previously, the author (1958, 1959) studied estimators of the standard deviation of normal, rectangular, and one-parameter exponential populations based on sample ranges and quasi-ranges. The results for the normal population are included in Chapter I, Section 1 and Tables A4 and A5 of the present volume; those for the rectangular population in Chapter II, Section 1 and Table B1. The estimators are quite satisfactory for these symmetric populations, but not for the one-parameter exponential, for which it was found that estimators based on a single order statistic are more efficient. That discovery led to the further research reported in this section.

1.2. ESTIMATORS OF σ FOR THE ONE-PARAMETER EXPONENTIAL POPULATION

1.2.1. ESTIMATORS BASED ON ONE ORDER STATISTIC OF A COMPLETE SAMPLE

For the one-parameter exponential population with parameter σ, which is both the mean and the standard deviation of the population, the probability density function is $f_1(x) = (1/\sigma) \exp(-x/\sigma)$, $0 \leq x < \infty$. The sample mean $\bar{x}$, which has variance σ^2/n, is the best linear unbiased estimator, and also the maximum likelihood estimator, of the parameter σ. The expected value and the variance of the kth order statistic, x_k, of a sample of size n from this population are given [see Epstein and Sobel (1953)] by

$$E(x_k) = \sigma \sum_{1}^{k} a_i \tag{1}$$

and

$$\text{var } x_k = \sigma^2 \sum_{1}^{k} a_i^2, \tag{2}$$

where $a_i = 1/(n - i + 1)$. Summations of a_i and a_i^2 are understood to be taken over values of the subscript i. An unbiased estimator of the parameter σ, based on the order statistic x_k, is given by $\tilde{\sigma}_k = c_k x_k$, where

$$c_k = 1/\sum_{1}^{k} a_i. \tag{3}$$

*Earlier versions of portions of this material were published by Harter (1961) and by Moore and Harter (1965).

The variance of this estimator is given by

$$V_k = \sigma^2 \sum_1^k a_i^2 \Big/ \left(\sum_1^k a_i \right)^2. \tag{4}$$

and its efficiency (relative to the best linear unbiased estimator $\bar{x}$) is $E_k = \text{var } \bar{x}/V_k$, where as mentioned above, var $\bar{x} = \sigma^2/n$. Thus the relative efficiency E_k is given by

$$E_k = \left(\sum_1^k a_i \right)^2 / n \sum_1^k a_i^2. \tag{5}$$

The best estimator of σ, based on one order statistic x_k, is the one for that value of k which minimizes V_k (maximizes E_k). The author is not aware of any analytical method for determining the value of k which yields the best estimator of σ; hence, for each value of n, V_k was computed for $k = 1(1)n$. When the best value of k for a given n had been found, the corresponding c_k and E_k were also computed. The computations were performed on the IBM 1620 computer. Table D1 gives, for $n = 1(1)100$, the value of k for the best estimator of σ, the coefficient c_k (to 6 significant figures), the coefficient, V_k/σ^2, of σ^2 in the variance V_k of the estimator (to 7 significant figures or 6 decimal places, whichever is less accurate), and the relative efficiency E_k (to 5 significant figures). The tabular values of c_k, V_k/σ^2, and E_k are accurate to within a unit in the last place given.

1.2.2. ESTIMATORS BASED ON TWO ORDER STATISTICS OF A COMPLETE SAMPLE

Unbiased linear estimators of the parameter σ, based on two order statistics x_l and x_m, are given by $\tilde{\sigma}_{lm} = c_l x_l + c_m x_m$, where $c_l E(x_l) + c_m E(x_m) = \sigma$, with $E(x_l)$ and $E(x_m)$ given by Equation (1), if k takes the values l and m. The variances of such estimators are given by

$$V_{lm} = c_l^2 \text{ var } x_l + c_m^2 \text{ var } x_m + 2 c_l c_m \text{ cov } (x_l, x_m). \tag{6}$$

where var x_l and var x_m are given by Equation (2), if k takes the values l and m, and cov (x_l, x_m) is given [see Sarhan (1954)] by

$$\text{cov } (x_l, x_m) = \sigma^2 \sum_1^l a_i^2 = \text{var } x_l, \quad (l < m). \tag{7}$$

It can be shown that, for given values of l and m, the values of c_l and c_m which yield the unbiased estimator $\tilde{\sigma}_{lm}$ with minimum variance are

$$c_l = 1 / \left(\sum_1^l a_i + \lambda \sum_1^m a_i \right) \tag{8}$$

and

$$c_m = \lambda c_l. \tag{9}$$

where

$$\lambda = \sum_{l+1}^m a_i \sum_1^l a_i^2 \Big/ \left(\sum_1^l a_i \sum_1^m a_i^2 - \sum_1^m a_i \sum_1^l a_i^2 \right). \tag{10}$$

By substituting from Equations (2) and (7)–(9) into Equation (6), one finds that the minimum variance of $\tilde{\sigma}_{lm}$, for given l and m, is

$$V_{lm} = \sigma^2 \left[(1 + 2\lambda) \sum_1^l a_i^2 + \lambda^2 \sum_1^m a_i^2 \right] \Big/ \left(\sum_1^l a_i + \lambda \sum_1^m a_i \right)^2. \tag{11}$$

The efficiency of this estimator (relative to the best linear unbiased estimator $\bar{x}$) is $E_{lm} = \text{var}\,\bar{x}/V_{lm}$, where, as before, $\text{var}\,\bar{x} = \sigma^2/n$. Thus the relative efficiency E_{lm} is given by

$$E_{lm} = \left(\sum_{1}^{l} a_i + \lambda \sum_{1}^{m} a_i\right)^2 \Big/ n\left[(1+2\lambda)\sum_{1}^{l} a_i^2 + \lambda^2 \sum_{1}^{m} a_i^2\right] \tag{12}$$

The best estimator of σ, based on two order statistics x_l and x_m, is the one for those values of l and m which minimize V_{lm} (maximize E_{lm}). The author is not aware of any analytical method for determining these values of l and m; hence, for each value of n, V_{lm} was computed for $l = 1(1)(n-1)$ and $m = (l+1)(1)n$. When the best values of l and m for a given n had been found, the corresponding c_l, c_m, and E_{lm} were also computed. The computations were performed on the IBM 1620 computer. Table D1 gives, for $n = 2(1)100$, the values of l and m for the best estimator of σ, the coefficients c_l and c_m (to 6 significant figures), the coefficient, V_{lm}/σ^2, of σ^2 in the variance V_{lm} of the estimator (to 7 decimal places), and the relative efficiency E_{lm} (to 5 significant figures). The tabular values of c_l, c_m, V_{lm}/σ^2, and E_{lm} are accurate to within a unit in the last place given.

1.2.3. ESTIMATORS BASED ON ONE ORDER STATISTIC OF A CENSORED SAMPLE

The minimum-variance unbiased one-order-statistic estimator of the parameter σ from a complete sample of size n from a one-parameter exponential population has been given in subsection 1.2.1 as $\tilde{\sigma}_r = c_r x_r$, where x_r is the rth order statistic of the sample, r is chosen so as to minimize the variance of $\tilde{\sigma}_r$, and c_r is given in Table D1. For a censored sample in which one knows only the first m of the n ordered sample values, as in a life test of n items which is terminated at the time of the mth failure, the most efficient estimator can easily be seen to be $\tilde{\sigma}_k = c_k x_k$, where $k = \min(m, r)$. The coefficients $c_k = c(k, n)$ have been computed for $n = 1(1)40$ and $m = 1(1)n$, and are given in Table D2, together with the efficiency of the best one-order-statistic estimator with respect to the best m-order-statistic estimator given by Epstein and Sobel (1953).

1.3. ESTIMATORS OF PARAMETERS OF THE TWO-PARAMETER EXPONENTIAL POPULATION

For the two-parameter exponential population with parameters α and σ, the probability density function is $f_2(x) = (1/\sigma)\exp[-(x-\alpha)/\sigma]$, $\alpha \leq x < \infty$. The mean μ of this population is given by $\mu = \alpha + \sigma$. For a sample of size n from this population, the expected value of the kth order statistic, x_k, exceeds by α the value given in Equation (1) for the one-parameter exponential population, and thus is given by

$$E(x_k) = \alpha + \sigma \sum_{1}^{k} a_i. \tag{13}$$

The variance of x_k and the covariance of x_l and x_m are the same as for the one-parameter exponential population, and hence are given by Equations (2) and (7), respectively.

Unbiased linear estimators of the parameters α and σ and the mean μ may be obtained from any two order statistics x_l and x_m. These estimators are of the form

$$\tilde{\alpha} = c_{\alpha l} x_l + c_{\alpha m} x_m. \tag{14}$$

$$\tilde{\sigma} = c_{\sigma l} x_l + c_{\sigma m} x_m. \tag{15}$$

and

$$\tilde{\mu} = c_{\mu l} x_l + c_{\mu m} x_m. \tag{16}$$

It has been shown [see Sarhan, Greenberg, and Ogawa (1960)] that, for given l and m, coefficients of the best linear estimators based on two order statistics x_l and x_m are given by

$$c_{\alpha l} = 1 + c_\alpha,\ c_{\alpha m} = -c_\alpha. \tag{17}$$

$$c_{\sigma l} = -c_\sigma,\ c_{\sigma m} = c_\sigma. \tag{18}$$

and $$c_{\mu l} = 1 + c_\alpha - c_\sigma,\ c_{\mu m} = c_\sigma - c_\alpha, \tag{19}$$

where $$c_\alpha = \sum_1^l a_i \Big/ \sum_{l+1}^m a_i \tag{20}$$

and $$c_\sigma = 1 \Big/ \sum_{l+1}^m a_i. \tag{21}$$

The variance of the estimator $\tilde{\sigma}$ is given by

$$V_{\tilde{\sigma}} = \sigma^2 \sum_{l+1}^m a_i^2 \Big/ \left(\sum_{l+1}^m a_i \right)^2. \tag{22}$$

and the variances of the estimators $\tilde{\alpha}$ and $\tilde{\mu}$ are given by

$$V_{\tilde{\alpha}} = \sigma^2 \sum_1^l a_i^2 + \left(\sum_1^l a_i \right)^2 V_{\tilde{\sigma}} = \sigma^2 \left[\sum_1^l a_i^2 + \left(\sum_1^l a_i \right)^2 \sum_{l+1}^m a_i^2 \Big/ \left(\sum_{l+1}^m a_i \right)^2 \right] \tag{23}$$

and $$V_{\tilde{\mu}} = \sigma^2 \sum_1^l a_i^2 + \left(\sum_1^l a_i - 1 \right)^2 V_{\tilde{\sigma}} = \sigma^2 \left[\sum_1^l a_i^2 + \left(\sum_1^l a_i - 1 \right)^2 \sum_{l+1}^m a_i^2 \Big/ \left(\sum_{l+1}^m a_i \right)^2 \right] \tag{24}$$

The best linear unbiased estimators of α, σ, and μ based on all order statistics [see Sarhan and Greenberg (1956)] are

$$\hat{\alpha} = \left[(n^2 - 1) x_1 - \sum_2^n x_i \right] \Big/ n(n-1). \tag{25}$$

$$\hat{\sigma} = \left[\sum_2^n x_i - (n-1) x_1 \right] \Big/ (n-1). \tag{26}$$

and

$$\hat{\mu} = \sum_1^n x_i / n = \bar{x}. \tag{27}$$

These are also the maximum-likelihood estimators. Their variances are

$$V_{\hat{\alpha}} = \sigma^2 / n(n-1). \tag{28}$$

$$V_{\hat{\sigma}} = \sigma^2 / (n-1), \tag{29}$$

and $$V_{\hat{\mu}} = \sigma^2 / n. \tag{30}$$

The efficiencies of the estimators $\tilde{\alpha}$, $\tilde{\sigma}$, and $\tilde{\mu}$ (relative to the best linear unbiased estimators $\hat{\alpha}$, $\hat{\sigma}$, and $\hat{\mu}$ based on all order statistics) are given by

$$E_{\tilde{\alpha}} = V_{\hat{\alpha}} / V_{\tilde{\alpha}} = \left(\sum_{l+1}^m a_i \right)^2 \Big/ n(n-1) \left[\sum_1^l a_i^2 \left(\sum_{l+1}^m a_i \right)^2 + \left(\sum_1^l a_i \right)^2 \sum_{l+1}^m a_i^2 \right] \tag{31}$$

$$E_{\tilde{\sigma}} = V_{\hat{\sigma}}/V_{\tilde{\sigma}} = \left(\sum_{l+1}^{m} a_i\right)^2 \Big/ (n-1)\sum_{l+1}^{m} a_i^2. \qquad (32)$$

and

$$E_{\tilde{\mu}} = V_{\hat{\mu}}/V_{\tilde{\mu}} = \left(\sum_{l+1}^{m} a_i\right)^2 \Big/ n\left[\sum_{1}^{l} a_i^2 \left(\sum_{l+1}^{m} a_i\right)^2 + \left(\sum_{1}^{l} a_i - 1\right)^2 \sum_{l+1}^{m} a_i^2\right]. \qquad (33)$$

The best estimators of α, σ, and μ, based on two order statistics x_l and x_m, are those for the values of l and m which minimize $V_{\tilde{\alpha}}$, $V_{\tilde{\sigma}}$, and $V_{\tilde{\mu}}$ (maximize $E_{\tilde{\alpha}}$, $E_{\tilde{\sigma}}$, and $E_{\tilde{\mu}}$). It can be shown that, for a fixed value of m, the variances of the estimators are smallest when $l = 1$. It can be seen from Equations (23) and (24) that, for a fixed value of l, the value of m which minimizes $V_{\tilde{\sigma}}$ also minimizes $V_{\tilde{\alpha}}$ and $V_{\tilde{\mu}}$. The author is not aware of any purely analytical method of determining the best value of m; hence, for each value of n, $V_{\tilde{\sigma}}$ was computed for $l = 1$ and $m = 2(1)n$. When the best value of m for a given n had been found, the corresponding c_α, c_σ, $V_{\tilde{\alpha}}$, $V_{\tilde{\mu}}$, $E_{\tilde{\alpha}}$, $E_{\tilde{\sigma}}$, and $E_{\tilde{\mu}}$ were also computed. The computations were performed on the IBM 1620 computer. Tables D3 gives, for $n = 2(1)100$, the value of m for the best estimators of α; σ, and μ, the factors c_α and c_σ (to 6 significant figures or 6 decimal places, whichever is less accurate), the coefficient, $V_{\tilde{\alpha}}/\sigma^2$, of σ^2 in the variance $V_{\tilde{\alpha}}$ (to 7 significant figures or 9 decimal places, whichever is less accurate), the coefficients, $V_{\tilde{\sigma}}/\sigma^2$ and $V_{\tilde{\mu}}/\sigma^2$, of σ^2 in the variances $V_{\tilde{\sigma}}$ and $V_{\tilde{\mu}}$ (to 7 significant figures or 7 decimal places, whichever is less accurate), and the relative efficiencies $E_{\tilde{\alpha}}$, $E_{\tilde{\sigma}}$, and $E_{\tilde{\mu}}$ (to 5 significant figures). The tabular values of c_α, c_σ, $V_{\tilde{\alpha}}/\sigma^2$, $V_{\tilde{\sigma}}/\sigma^2$, $V_{\tilde{\mu}}/\sigma^2$, $E_{\tilde{\alpha}}$, $E_{\tilde{\sigma}}$, and $E_{\tilde{\mu}}$ are accurate to within a unit in the last place given.

1.4. REMARKS

(i) The variance of the best estimator of σ for the two-parameter exponential population based on two order statistics x_1 and x_m from a sample of size n is the same as the variance of the best estimator of σ for the one-parameter exponential population based on one order statistic x_k from a sample of size $n-1$, with $k = m-1$. This can be seen by a comparison of Equations (4) and (22), though the author did not observe this fact until confronted with equal numerical values. The relative efficiencies of these estimators are also equal, since in each case the variance of the best linear unbiased estimator based on all order statistics is $\sigma^2/(n-1)$.

(ii) For the one-parameter exponential population, the values $k = 80$, $l = 64$, and $m = 93$, with relative efficiencies $E_k = 65.093$ percent and $E_{lm} = 82.460$ percent, for $n = 100$ compare favorably with the results obtained by Sarhan, Greenberg, and Ogawa (1960), whose corresponding asymptotic values are $0.7968n$, $0.6386n$, $0.9266n$, 64.76 percent and 82.03 percent.

(iii) For the two-parameter exponential population, it can be seen from Equations (20) and (21) that, since $l = 1$ for the best estimators, $c_\alpha = a_1 c_\sigma = c_\sigma/n$. For convenience, however, separate columns for c_α and c_σ are given in Table D3.

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2. INTERVAL ESTIMATION OF THE PARAMETER σ*

2.1. INTRODUCTION

During the past twelve years, several papers have been published on point and interval estimation of parameters of various populations by the use of order statistics or differences of order statistics (ranges and quasi-ranges). Harter (1959) gave theory and extensive tables for point estimation of the population standard deviation for a rectangular population, based on the sample range, and for a normal population, based on one quasi range and on linear combinations of two quasi-ranges. The results are included in Chapter I, Section 1; Chapter II, Section 1; and Tables A4, A5, and B1 of the present volume. The estimator based on the sample range is the efficient estimator for a rectangular population, while in the case of a normal population the efficiencies of the estimators based on one quasi-range and on the best linear combination of two quasi-ranges are greater than or equal to the asymptotic values, approximately 65 percent and 80 percent, respectively. For asymmetric populations, however, the efficiency of estimators based on ranges and quasi-ranges is not so high. For example, in the case of a one-parameter negative exponential population, better estimates of the parameter, which is both mean and standard deviation, can be obtained from a single order statistic than from a quasi-range. Harter (1961b) gave theory and tables for point estimation of the parameter for a one-parameter negative exponential population from one or two order statistics and of the parameters for a two-parameter negative exponential population from two order statistics. The theeory is included in Section 1 of this chapter and the tables as Tables D1 and D3 of this volume.

Interval estimation of population parameters from sample quasi-ranges has been considered in papers by Chu (1957) and Chu, Leone, and Topp (1957). The method, outlined in the latter paper, of obtaining confidence bounds by first applying distribution-free methods and then imposing the distribution, was applied by Leone, Rutenberg, and Topp (1961), who gave tables of confidence intervals for the standard deviation of normal, one-parameter negative exponential, and rectangular populations. Harter (1961a) pointed out that the exact confidence intervals, in which the coefficients of the quasi-ranges are the reciprocals of percentage points of those quasi-ranges for the standardized population of the type under consideration, have expected length much shorter than the approximate confidence intervals given by Leone, Rutenberg, and Topp. He illustrated this point by giving tables of exact confidence intervals, based on the sample range, for the standard deviation of a rectangular population. These results are given in Chapter II, Section 2 and Table B4 of the present volume. A similar tabulation of exact confidence intervals for the standard deviation of a normal population, each based on one sample quasi-range, included as Table A9 of this volume, was first published by Harter (1964c). In the latter paper, the criterion of minimizing the expected length (maximizing the effectiveness) of the substitute confidence interval has been replaced by the criterion of maximizing the efficiency of the substitute confidence interval, as defined and discussed in detail in that paper. Briefly, the superiority of the new criterion lies in the fact that it penalizes the occurrence of cases in which the upper confidence bound falls short of (or the lower confidence bound exceeds) the true parameter value, whereas the old one actually rewards such occurrences. Efficiency of interval estimators is defined by a logical extension of the definition of efficiency of point estimators. The efficiency of a substitute upper confidence bound is defined as the ratio, expressed as a percentage, of the mean squared deviation of the conventional upper confidence bound from the true parameter value to the mean squared deviation of the substitute upper confidence bound from the true parameter value. Similarly, the efficiency of a substitute central confidence interval is defined as the ratio, expressed as a percentage, of the sum of the mean squared deviations of the conventional upper and lower confidence bounds from the true parameter value to the sum of the mean squared deviations of the substitute upper and lower confidence bounds from the true parameter value. For details concerning these criteria, the reader is referred to Chapter I, Section 2 of this volume.

*Earlier versions of this material were published by Harter (1963, 1964b).

Just as a single order statistic will yield a more efficient point estimator of the parameter of a one-parameter negative exponential population than will a quasi-range, it will also provide more efficient upper confidence bounds and central confidence intervals. Appendix D contains a table (Table D4) of upper and lower confidence bounds (confidence $1-P$) and central confidence intervals (confidence $1-2P$) for the parameter of a one-parameter negative exponential population, based on the mth order statistic of a sample of size n, for $P = .0001, .0005, .001, .005, .01, .025, .05, .1(.1).5$ and $n = 1(1)20(2)40$ for values of m which maximize the efficiency of the upper confidence bound and/or that of the central confidence interval.

2.2. MATHEMATICAL FORMULATION

2.2.1 CUMULATIVE DISTRIBUTION OF TRANSFORMED VARIABLE $y = e^{-x_m}$

The probability density function $\phi(x_m)$ of the mth order statistic of a sample of size n from a population having probability density function $f(x)$ and cumulative distribution function $F(x)$ is given by

$$\phi(x_m) = [\Gamma(n+1)/\Gamma(m)\Gamma(n-m+1)][F(x_m)]^{m-1}[1-F(x_m)]^{n-m}f(x_m). \tag{1}$$

If we make the substitution $y = 1 - F(x_m)$, we obtain as the probability density function of the transformed variable

$$\phi(y) = [\Gamma(n+1)/\Gamma(m)\Gamma(n-m+1)](1-y)^{m-1}y^{n-m}. \tag{2}$$

Integrating between the limits 0 and y, we obtain the cumulative distribution function

$$\Phi(y) = [\Gamma(n+1)/\Gamma(m)\Gamma(n-m+1)]\int_0^y (1-y)^{m-1}y^{n-m}dy, \tag{3}$$

which may be written in terms of the incomplete Beta-function ratio as

$$\Phi(y) = I_y(n-m+1, m). \tag{4}$$

Note that Equation (4) holds in general for any population; in the case at hand, that of the one-parameter negative exponential population, $F(x_m) = 1 - e^{-x_m}$, so $y = e^{-x_m}$.

2.2.2. CONVENTIONAL INTERVAL ESTIMATORS OF σ

The conventional point estimator, $\hat{\sigma}_{n,n}$, of the parameter σ from a sample of size n is simply the sample mean $\bar{x}$. Since we are working with the standardized population ($\sigma = 1$), which we may do without loss of generality, the upper and lower conventional confidence bounds (confidence $1-P$) are given by $B_u = \bar{x}/\bar{x}_P$ and $B_l = \bar{x}/\bar{x}_{1-P}$, respectively, where $\bar{x}_P$ and $\bar{x}_{1-P}$ are the percentage points of the distribution of $\bar{x}$ corresponding to cumulative probabilities P and $1-P$, respectively.

The conventional upper confidence bound (confidence $1-P$), based on the sample mean, has expected value given by

$$E_n(B_u) = 2n/\chi^2_{P,2n} \tag{5}$$

and the conventional central confidence interval (confidence $1-2P$), also based on the sample mean, has expected length given by

$$E_n(B_u - B_l) = 2n(1/\chi^2_{P,2n} - 1/\chi^2_{1-P,2n}). \tag{6}$$

The first subscript on chi-square represents the cumulative probability and the second is the number of degrees of freedom, n being the sample size.

If only the first m ordered sample values are known, the point estimator and the confidence bounds obtained from this censored sample will, for the sake of brevity, be called the censored point estimator and the censored confidence bounds, respectively. The censored point estimator $\hat{\sigma}_{m,n}$, which is given by

$$\hat{\sigma}_{m,n} = [x_1 + x_2 + \ldots + x_m + (n-m)x_m]/m, \tag{7}$$

has a chi-square over degrees of freedom distribution with $2m$ degrees of freedom [see Epstein and Sobel (1953)]. Since this is exactly the same as the distribution of the mean $\bar{x}$ for a sample of size m, the expected value of the censored upper confidence bound and the expected length of the censored central confidence interval may be obtained by replacing n by m in Equations (5) and (6), which yields

$$E_m(B_u) = 2m/\chi^2_{P,\,2m} \tag{8}$$

and

$$E_m(B_u - B_l) = 2m(1/\chi^2_{P,\,2m} - 1/\chi^2_{1-P,\,2m}). \tag{9}$$

The mean squared deviation of the conventional upper confidence bound from the true parameter value may be written in the form

$$E(D^2_{u,\,u}) = E[(B_u - 1)^2] = E[(\bar{x}/\bar{x}_P - 1)^2] = 1 - 2E(\bar{x})/\bar{x}_P + E(\bar{x}^2)/\bar{x}^2_P. \tag{10}$$

Since $\bar{x}$ has a chi-square over degrees of freedom distribution with $2n$ degrees of freedom, $E(\bar{x}) = E[\chi^2_{2n}/2n] = 1$ and $E(\bar{x}^2) = E\{[\chi^2_{2n}/2n]^2\} = (2n+2)/2n = (n+1)/n$, so that Equation (10) may be written in the form

$$E(D^2_{u,\,u}) = 1 - 4n/\chi^2_{P,\,2n} + 4n(n+1)/[\chi^2_{P,\,2n}]^2. \tag{11}$$

Similarly, the mean squared deviation of the conventional lower confidence bound from the true parameter value is given by

$$E(D^2_{u,\,l}) = 1 - 4n/\chi^2_{1-P,\,2n} + 4n(n+1)/[\chi^2_{1-P,\,2n}]^2. \tag{12}$$

The mean squared deviations of the censored upper and lower confidence bounds may be obtained by replacing n by m in Equations (11) and (12) for the conventional confidence bounds, which yields

$$E(D^2_{um,\,u}) = 1 - 4m/\chi^2_{P,\,2m} + 4m(m+1)/[\chi^2_{P,\,2m}]^2 \tag{13}$$

and

$$E(D^2_{um,\,l}) = 1 - 4m/\chi^2_{1-P,\,2m} + 4m(m+1)/[\chi^2_{1-P,\,2m}]^2. \tag{14}$$

2.2.3. EFFECTIVENESS OF INTERVAL ESTIMATORS BASED ON x_m

The substitute upper and lower confidence bounds (confidence $1-P$), based on the mth order statistic x_m, are given by $B_{um} = x_m/x_{m,\,P}$ and $B_{lm} = x_m/x_{m,\,1-P}$, respectively, where $x_{m,\,P}$ and $x_{m,\,1-P}$ are the percentage points of the distribution of x_m corresponding to cumulative probabilities P and $1-P$, respectively.

The expected value of the substitute upper confidence bound is given by

$$E(B_{um}) = E(x_m)/x_{m,\,P} \tag{15}$$

and the expected length of the substitute central confidence interval is given by

$$E(B_{um} - B_{lm}) = E(x_m)(1/x_{m,\,P} - 1/x_{m,\,1-P}). \tag{16}$$

The effectiveness of the substitute upper confidence bound is then

$$F_u = 100E_n(B_u)/E(B_{um}), \tag{17}$$

while that of the substitute central confidence interval is

$$F_l = 100E_n(B_u - B_l)/E(B_{um} - B_{lm}), \tag{18}$$

where $E_n(B_u)$ and $E_n(B_u - B_l)$ are given by Equations (5) and (6) and $E(B_{um})$ and $E(B_{um} - B_{lm})$ by Equations

(15) and (16), respectively. The relative effectiveness of the substitute upper confidence bound (as compared with the censored bound) is given by

$$S_u = 100E_m(B_u)/E(B_{um}), \tag{19}$$

and that of the substitute central confidence interval (as compared with the censored interval) is given by

$$S_i = 100E_m(B_u - B_l)/E(B_{um} - B_{lm}), \tag{20}$$

where $E_m(B_u)$ and $E_m(B_u - B_l)$ are given by Equations (8) and (9), respectively.

2.2.4. EFFICIENCY OF INTERVAL ESTIMATORS BASED ON x_m

The mean squared deviation of the substitute upper confidence bound, based on the mth order statistic, from the true parameter value may be written in the form

$$E(D^2_{s,u}) = E(B_{um} - 1)^2 = E[(x_m/x_{m,P} - 1)^2] = 1 - 2E(x_m)/x_{m,P} + E(x_m^2)/x^2_{m,P}. \tag{21}$$

Similarly, the mean squared deviation of the substitute lower confidence bound, based on the mth order statistic, from the true parameter value is given by

$$E(D^2_{s,l}) = 1 - 2E(x_m)/x_{m,1-P} + E(x_m^2)/x^2_{m,1-P}. \tag{22}$$

In connection with Equations (21) and (22), recall that the expected value and the variance of x_m (when $\sigma = 1$) are given [see Epstein and Sobel (1953)] by

$$E(x_m) = \sum_{j=1}^{m} [1/(n-j+1)] \tag{23}$$

and

$$V(x_m) = \sum_{j=1}^{m} [1/(n-j+1)^2], \tag{24}$$

and that the expected value of x_m^2 is simply

$$E(x_m^2) = V(x_m) + [E(x_m)]^2. \tag{25}$$

The efficiency of the substitute upper confidence bound (as compared with the conventional bound) is given by

$$E_u = 100E(D^2_{n,u})/E(D^2_{s,u}) \tag{26}$$

and that of the substitute central confidence interval (as compared with the conventional interval) is given by

$$E_i = 100[E(D^2_{n,u}) + E(D^2_{n,l})]/[E(D^2_{s,u}) + E(D^2_{s,l})]. \tag{27}$$

The relative efficiency of the substitute upper confidence bound (as compared with the censored bound) is given by

$$R_u = 100E(D^2_{m,u})/E(D^2_{s,u}) \tag{28}$$

and that of the substitute central confidence interval (as compared with the censored interval) is given by

$$R_i = 100[E(D^2_{m,u}) + E(D^2_{m,l})]/[E(D^2_{s,u}) + E(D^2_{s,l})]. \tag{29}$$

2.3. METHOD OF COMPUTATION OF TABLES

2.3.1. COEFFICIENTS OF x_m IN EXACT CONFIDENCE BOUNDS FOR σ

The computation of the tables required determination of the coefficients, $1/x_{m,P}$ and $1/x_{m,1-P}$ respectively, of the mth order statistic x_m in the substitute upper and lower confidence bounds B_{um} and B_{lm}. According to Equation (4), the cumulative distribution function of $y=e^{-x_m}$ is the incomplete Beta-function ratio $I_y(n-m+1, m)$. Hence the percentage points y_P of y are the percentage points of the incomplete Beta-function ratio (the Beta distribution), and from the relation between y and x_m we see that $1/x_{m,P}=-1/\ln y_P$ and $1/x_{m,1-P}=-1/\ln y_{1-P}$. Hence the coefficients of x_m in the substitute upper and lower confidence bounds are simply the negative reciprocals of the natural logarithms of the percentage points of the incomplete Beta-function ratio. Since no sufficiently extensive and accurate table of the percentage points of the incomplete Beta-function ratio was available, it was necessary to compute such a table [see Harter (1964a)].

2.3.2. EFFECTIVENESS OF INTERVAL ESTIMATORS BASED ON x_m

The first step was the determination of the expected values of the conventional and censored upper confidence bounds and the expected lengths of the conventional and censored central confidence intervals, which was accomplished by the use of Equations (5), (8), (6), and (9), respectively. Use was made of the previously discussed new table of percentage points of the chi-square distribution [see Harter (1964a)].

The second step was the determination of the expected value of the substitute upper confidence bound and the expected length of the substitute central confidence interval, which was accomplished by the use of Equations (15) and (16), respectively.

The third and final step was the calculation of the effectivenesses and relative effectivenesses of the substitute upper confidence bounds and the substitute central confidence intervals, which required the use of Equations (17)–(20).

All of the above computations were performed on the IBM 7094 computer. One FORTRAN program was sufficient for all of the computations except those involved in obtaining the auxiliary table of percentage points of the Beta distribution, which was computed in advance and used as input to the main program, along with the table of percentage points of the chi-square distribution. In order to avoid loss of accuracy, it was necessary to use double precision for the internal arithmetic operations, even though both the input and the output were in single precision.

For each sample size n, values of the coefficients of the mth order statistic (for several values of m) in the substitute upper and lower confidence bounds were rounded to 7 significant figures or 6 decimal places, whichever is less accurate. The effectivenesses and relative effectivenesses of the substitute upper confidence bounds and the substitute central confidence intervals were rounded to the nearest tenth of one percent. The results, together with the corresponding values of n, m, $1-P$, and $1-2P$, were punched on IBM cards. These cards were sorted manually. For each pair of values of n and $1-P$, the card for that value of m which maximizes the effectiveness of the upper confidence bound (confidence $1-P$) was placed in deck A. In most cases (all but 70 out of 330), the same value of m also maximizes the effectiveness of the central confidence interval (confidence $1-2P$). For each of the 70 cases in which this is not true, an asterisk was punched after the effectiveness of the central confidence interval in the card in deck A, and the card for the value of m which does maximize the effectiveness of the central confidence interval was placed in deck B. All cards not belonging either to deck A or to deck B were discarded. Table D4A, with suitable title and column headings, was reproduced from deck A, and Table D4B, with suitable title and the same column headings, was reproduced from deck B.

2.3.3. EFFICIENCY OF INTERVAL ESTIMATORS BASED ON x_m

The first step was the determination of the mean squared deviations of the conventional upper and lower confidence bounds and the censored upper and lower confidence bounds from the true parameter value, which was accomplished by the use of Equations (11)–(14). Use was made of the previously mentioned new table of percentage points of the chi-square distribution [see Harter (1964a)].

The second step was the determination of the mean squared deviations of the substitute upper and lower confidence bounds from the true parameter value, which was accomplished by the use of Equations (21)–(25).

The third and final step was the calculation of the efficiencies and relative efficiencies of the substitute upper confidence bounds and the substitute central confidence intervals, which required the use of Equations (26)–(29).

All of the above computations were performed on the IBM 7094 computer. One FORTRAN program was sufficient for all of the computations except those involved in obtaining the auxiliary tables of percentage points of the chi-square and Beta distributions, which were used as input to the main program. In order to avoid loss of accuracy, it was necessary to use double precision for the internal arithmetic operations, even though both the input and the output were in single precision.

For each sample size n, values of the coefficients of the mth order statistic (for several values of m) in the substitute upper and lower confidence bounds were rounded to 7 significant figures or 6 decimal places, whichever is less accurate. The efficiencies and relative efficiencies of the substitute upper confidence bounds and the substitute central confidence intervals were rounded to the nearest tenth of one percent. The results, together with the corresponding values of n, m, $1-P$, and $1-2P$, were punched on IBM cards. These cards were sorted manually. For each pair of values of n and $1-P$, the card for that value of m which maximizes the efficiency of the upper confidence bound (confidence $1-P$) was placed in deck C. In most cases (all but 14 out of 330), the same value of m also maximizes the efficiency of the central confidence interval (confidence $1-2P$). For each of the 14 cases in which this is not true, an asterisk was punched after the efficiency of the central confidence interval in the card in deck C, and the card for the value of m which does maximize the efficiency of the central confidence interval was placed in deck D. All cards not belonging either to deck C or to deck D were discarded. Table D4C, with suitable title and column headings, was reproduced from deck C, and Table D4D, with suitable title and the same column headings, was reproduced from deck D.

2.4. COMPARISON WITH OTHER TABLES

The effectiveness and the efficiency of the best exact substitute central confidence intervals are in the neighborhood of 80 percent and 60 percent, respectively, except for very small samples, in which case they are even higher. These compare with an effectiveness in the neighborhood of 55 percent, corresponding to an efficiency of approximately $(.55)^2 = 30$ percent, or even less, for the approximate confidence intervals of Leone, Rutenberg, and Topp (1961). There is a twofold reason for the difference, which is due partly to the superiority of the exact method over the approximation based on distribution-free methods and partly to the use of a single order statistic instead of a quasi-range. The effectiveness and the efficiency of the exact confidence intervals could have been made slightly higher by optimizing the upper and lower confidence bounds separately as Leone, Rutenberg, and Topp did. It was decided that the small increase in effectiveness or efficiency that would have resulted was not worth the additional complication of having the upper and lower confidence bounds based on different order statistics.

The effectiveness of the best exact substitute upper confidence bounds is even higher than that of the best exact substitute central confidence intervals. The efficiency of the best exact substitute upper confidence bounds is, like that of the best exact substitute central confidence intervals, in the neighborhood of 60 percent, except for very small samples, for which it is even higher. In these cases, no other tables are available for purposes of comparison.

2.5. POSSIBLE USES OF THE TABLES

One advantage often claimed for substitute estimates is that they are easier to compute than the conventional estimates. In this case, there is little advantage here, since the conventional estimates are based on the sample mean, which is itself relatively easy to compute. The principal uses of the present tables will probably be in obtaining interval estimates for the mean time-to-failure of (say) electronic components on the basis of incomplete results of a life test, without waiting for all of the components in the sample placed on test to fail. In this context, the relative efficiencies are quite meaningful, since the censored interval estimators are the best that are available at the time of occurrence of the mth failure.

2.6. NUMERICAL EXAMPLE

Suppose that 20 components are subjected to a life test and that the numbers of hours to failure are as follows:

2.37	58.93	80.90	108.92	167.59
17.56	71.48	90.87	112.26	282.49
34.84	71.84	91.22	126.87	335.33
36.38	79.31	96.35	127.05	341.19

Assuming that the life of components of this type has a one-parameter negative exponential distribution, one may wish to set a 99 percent upper confidence bound on the parameter σ. This may be done in a number of ways, of which three will be discussed here. The conventional bound is $\hat{\sigma}_{20,20}/(\chi^2_{01,40}/40)$, where the conventional point estimator $\hat{\sigma}$ is simply the mean life, $\bar{x}$. Numerically, the conventional bound is 116.69/(22.1643/40) = 210.59 hours. Suppose, however, that the experimenter decides to terminate the test at the time of the seventeenth failure. Then the best bound that he can obtain is the censored bound $\hat{\sigma}_{17,20}/(\chi^2_{01,34}/34)$, where the censored point estimator $\hat{\sigma}_{17,20}$ can be computed from Equation (7). Numerically, the censored bound is 110.44/(17.7891/34) = 211.09 hours. The most efficient (effective) substitute bound $B_{u,17}$, where B_{um}/x_m can be read from Table D4C(D4A), is almost as good and is easier to compute. Numerically, the substitute bound is 1.155046(167.59) = 193.57 hours.

The "data" for this example were actually obtained by drawing a random sample of size 20 from a one-parameter exponential population with parameter $\sigma = 100$ hours and then ordering the observations. Since the substitute bound is closer to the true value of the parameter than is either the censored bound or the conventional bound, one might be led to the erroneous conciusion that substitute bounds are better than censored or conventional ones. This may be true in some individual cases, as in the present one, because of sampling fluctuations, but it is not true on the average. The true situation can be seen by comparing expected values, which are 100/(22.1643/40) = 180.47 hours for the conventional bound, 100/(17.7891/34) = 191.13 hours for the censored bound, and 1.155046(176.441) = 203.80 hours for the substitute bound, or better still by comparing efficiencies. From Table D4C, one finds that the efficiency of the substitute bound (compared with the conventional bound) is 58.3 percent and that its relative efficiency (compared with the censored bound) is 75.2 percent.

2.7. REFERENCES

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CHAPTER V

SINGLY CENSORED SAMPLES FROM POPULATIONS RELATED TO THE EXPONENTIAL

1. WEIBULL POPULATION WITH KNOWN LOCATION AND SHAPE PARAMETERS*

1.1. INTRODUCTION

Epstein and Sobel (1953) have pointed out the advantage of the use of ordered data from truncated tests to estimate the parameters of parent populations, and have worked out details for the exponential distribution. In particular, they have derived an estimator $\hat{\sigma}$ (which is maximum likelihood, unbiased, and minimum variance), based on the first m out of n ordered observations, of the parameter σ of an exponential population and have shown that $2m\hat{\sigma}/\sigma$ has a chi-square distribution with $2m$ degrees of freedom (independent of n). They have also given without derivation the maximum-likelihood estimator $\hat{\theta^K}$, based on the first m out of n ordered observations, of θ^K, where θ is the scale parameter of a Weibull population with known shape parameter K. N. R. Mann (1963, p. 39) has stated without proof that $2m\hat{\theta^K}/\theta^K$ has a chi-square distribution with $2m$ degrees of freedom. The missing derivation and proof are supplied in the present section. Expressions are given for upper and lower confidence bounds, $\bar{\theta}$ and $\underline{\theta}$, and for the efficiencies, as defined by Harter (1964 b, c) [see Chapter I, Section 2 and Chapter IV, Section 2 of the present volume], of $\bar{\theta}$ and the central confidence interval $(\underline{\theta}, \bar{\theta})$. Brief discussions of the method of computation of a table of unbiasing factors for maximum-likelihood estimators and variances of unbiased estimators and of its use are given, as well as a numerical example which illustrates the computation of both point and interval estimates and the efficiencies of both point and interval estimators.

1.2. POINT ESTIMATION OF THE SCALE PARAMETER θ

1.2.1. MAXIMUM-LIKELIHOOD ESTIMATOR FOR THE SCALE PARAMETER

The probability density function of the random variable Y having a Weibull distribution with location parameter 0, scale parameter θ, and shape parameter K is given by

$$f(y) = \begin{cases} (K/\theta)(y/\theta)^{K-1}\exp[-(y/\theta)^K], & y > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{1}$$

Now if we define the random variable X by $X = Y^K$ and make the change of variable $x = y^K$ in Equation (1), we find the probability density function of the random variable X to be

$$g(x) = \begin{cases} \exp(-x/\theta^K)/\theta^K, & x > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{2}$$

which is the familiar exponential density function with parameter $\sigma = \theta^K$. Therefore if Y has a Weibull distribution with scale parameter θ and shape parameter K and if $X = Y^K$, then X is exponentially distributed with parameter $\sigma = \theta^K$. Hence a maximum likelihood m-order-statistic estimator for θ can be obtained from the "best" m-order-statistic estimator for $\sigma = \theta^K$ derived by Epstein and Sobel (1955), which is given by

$$\hat{\sigma}_{mn} = [x_{1n} + x_{2n} + \ldots + x_{mn} + (n-m)x_{mn}]/m, \tag{3}$$

where $x_{in} (i = 1, 2, \ldots, m)$ are the first m order statistics of a sample of size n from an exponential population. Now, taking the Kth root of both sides of Equation (3), we obtain

$$\hat{\sigma}_{mn}^{1/K} = \{[x_{1n} + x_{2n} + \ldots + x_{mn} + (n-m)x_{mn}]/m\}^{1/K}. \tag{4}$$

*An earlier version of this material was published by Harter and Moore (1965).

Since $x_{in} = y_{in}^K$ we can write

$$\hat{\theta}_{mn} = \hat{\sigma}_{mn}^{1/K} = \{[y_{1n}^K + y_{2n}^K + \ldots + y_{mn}^K + (n-m)y_{mn}^K]/m\}^{1/K}. \tag{5}$$

Now, since $\hat{\sigma}_{mn}$ is a maximum-likelihood estimator of σ, $\hat{\theta}_{mn} = \hat{\sigma}_{mn}^{1/K}$ is a maximum-likelihood estimator of $\theta = \sigma^{1/K}$.

The probability density function of the random variable $X_1 = \hat{\sigma}_{mn}$ is given by Epstein and Sobel (1953) as

$$f_m(x_1) = \begin{cases} [1/\Gamma(m)](m/\sigma)^m x_1^{m-1} \exp(-mx_1/\sigma), & x_1 > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{6}$$

Now we let $\hat{\theta}_{mn} = \hat{\sigma}_{mn}^{1/K}$ or $Y_1 = X_1^{1/K}$ and we find the probability density function of $Y_1 = \hat{\theta}_{mn}$ to be

$$g_m(y_1) = \begin{cases} [K/\Gamma(m)](m/\sigma)^m y_1^{Km-1} \exp(-my_1^K/\sigma), & y_1 > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{7}$$

Now, making the substitution $\sigma = \theta^K$ in Equation (7), we obtain

$$g_m(y_1) = \begin{cases} [K/\Gamma(m)](m/\theta^K)^m y_1^{Km-1} \exp(-my_1^K/\theta^K), & y_1 > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{8}$$

Hereafter, for simplicity, we shall denote $\hat{\theta}_{mn}$ by $\hat{\theta}$.

1.2.2. UNBIASED ESTIMATOR FOR THE SCALE PARAMETER

The expected value of $\hat{\theta}$ is found by using Equation (8) to be

$$E(\hat{\theta}) = \{\theta\Gamma(m + 1/K)\}/\{m^{1/K}\Gamma(m)\}. \tag{9}$$

Hence an unbiased estimator of θ is given by

$$\tilde{\theta} = [m^{1/K}\Gamma(m)/\Gamma(m + 1/K)]\hat{\theta}. \tag{10}$$

The variance of the unbiased estimator $\tilde{\theta}$ is found to be

$$\text{Var } \tilde{\theta} = \theta^2\{[\Gamma(m)\Gamma(m + 2/K)/\Gamma^2(m + 1/K)] - 1\}. \tag{11}$$

Values of the unbiasing factor $\tilde{\theta}/\hat{\theta}$ for the maximum-likelihood estimator and of the ratio Var $\tilde{\theta}/\theta^2$ of the variance of the unbiased estimator to θ^2, expressions for which can be obtained by dividing both sides of Equation (10) by $\hat{\theta}$ and both sides of Equation (11) by θ^2, were computed for $m = 1(1)100$ and $K = 0.5(0.5)4.0(1.0)8.0$. The computations were performed on the IBM 1620 computer with FORTRAN programming, use being made of Stirling's approximation to the Gamma function. Twelve decimal digits were carried in the computations, but the values of the unbiasing factor were rounded to 6 decimal places (6 or 7 significant digits) and those of the variance to 8 decimal places (5 to 9 significant digits). The results are shown in Table E1.

1.2.3. USE OF TABLE

In life-testing situations, one may wish to terminate a test without waiting for all n of the items placed on test to fail. If the life distribution is Weibull with known shape parameter K, where K is one of the values included in Table E1, and if the test is terminated at the time of the mth failure ($m \leq 100$), one can compute a maximum-likelihood estimate $\hat{\theta}$ of the scale parameter θ from Equation (5) and then multiply $\hat{\theta}$ by the unbiasing factor $\tilde{\theta}/\hat{\theta}$ given in Table E1 to obtain an unbiased estimate $\tilde{\theta}$. The ratio, Var $\tilde{\theta}/\theta^2$, of the variance of the unbiased estimator to θ^2 is also given in the table. The efficiency E_p of the unbiased point estimator based on the first m order statistics as compared with the one based on all n order statistics ($m < n \leq 100$)

can be found by taking the ratio of two entries in the Var $\bar{\theta}/\theta^2$ columns of Table E1. It can be seen that the percentage efficiency is approximately $100\ m/n$.

1.3. INTERVAL ESTIMATION OF THE SCALE PARAMETER θ

1.3.1. CONFIDENCE BOUNDS FOR THE SCALE PARAMETER

From Equation (8) it can be easily seen that $2m\ \hat{\theta}^K/\theta^K$ has a chi-square distribution with $2m$ degrees of freedom:

$$2m\ \hat{\theta}^K/\theta^K = \chi^2_{2m}. \tag{12}$$

Solving for θ, we obtain

$$\theta = (2m/\chi^2_{2m})^{1/K}\ \hat{\theta}. \tag{13}$$

Then an upper confidence bound with confidence level $1-P$ (lower confidence bound with confidence level P) on θ is given by

$$\bar{\theta}_{1-P} = \underline{\theta}_P = (2m/\chi^2_{2m,\,P})^{1/K}\ \hat{\theta}. \tag{14}$$

where the first subscript on χ^2 is the number of degrees of freedom and the second one is the cumulative probability. The interval between lower and upper confidence bounds, each with confidence level $1-P$, will be called a central confidence interval with confidence level $1-2P$. Equations (12)–(14) remain valid when $m=n$, in which case Equation (14) is an expression for the conventional confidence bound based on all n observations.

1.3.2. EFFICIENCY OF CONFIDENCE BOUNDS AND INTERVALS

Harter (1964 b, c) [see Chapter I, Section 2 and Chapter IV, Section 2, of the present volume] has defined the efficiency of a substitute upper confidence bound as the ratio, expressed as a percentage, of the mean squared deviation of the conventional upper confidence bound from the true parameter value to the mean squared deviation of the substitute upper confidence bound from the true parameter value. This definition may be expressed symbolically in the form

$$E_u = 100E[(\bar{\theta}-\theta)^2]/E[(\bar{\theta}'-\theta)^2], \tag{15}$$

where E_u is the efficiency (in percent) of the substitute upper confidence bound, $E[(\bar{\theta}-\theta)^2]$ is the mean squared deviation of the conventional upper confidence bound $\bar{\theta}$ from the true value θ of the parameter, and $E[(\bar{\theta}'-\theta)^2]$ is the mean squared deviation of the substitute upper confidence bound $\bar{\theta}'$ from the true value θ of the parameter. Further, the efficiency of a substitute central confidence interval is defined as the ratio, expressed as a percentage, of the sum of the mean squared deviations of the conventional upper and lower confidence bounds from the true parameter value to the sum of the mean squared deviations of the substitute upper and lower confidence bounds from the true parameter value. This definition in symbolic form is given by

$$E_i = 100\{E[(\bar{\theta}-\theta)^2]+E[(\underline{\theta}-\theta)^2]\}/\{E[(\bar{\theta}'-\theta)^2]+E[(\underline{\theta}'-\theta)^2]\}. \tag{16}$$

where E_i is the efficiency (in percent) of the substitute central confidence interval, $E[(\bar{\theta}-\theta)^2]$ and $E[(\bar{\theta}'-\theta)^2]$ are defined as above, and $E[(\underline{\theta}-\theta)^2]$ and $E[(\underline{\theta}'-\theta)^2]$ are respectively the mean squared deviations of the conventional and substitute lower confidence bounds $\underline{\theta}$ and $\underline{\theta}'$ from the true value θ of the parameter.

Quayle (1963) has shown that the mean squared deviation $E[(\bar{\theta}-\theta)^2]$ of the conventional upper confidence bound with confidence level $1-P$, based on all n observations, from the true value θ of the scale parameter of a Weibull population with known shape parameter K is given by

$$E[(\bar{\theta}-\theta)^2] = 1-2^{1+1/K}[\Gamma(n+1/K)/\Gamma(n)][1/\chi^2_{2n,\,P}]^{1/K}+2^{2/K}[\Gamma(n+2/K)/\Gamma(n)][1/\chi^2_{2n,\,P}]^{2/K} \tag{17}$$

and that the mean squared deviation $E[(\underline{\theta}-\theta)^2]$ of the corresponding conventional lower confidence bound is found by replacing $\bar{\theta}$ by $\underline{\theta}$ and P by $1-P$ in Equation (17). Since $2n\hat{\theta}^K_{nn}/\theta^K$ is distributed as χ^2 with $2n$ degrees of freedom and $2m\hat{\theta}^K_{mn}/\theta^K$ as χ^2 with $2m$ degrees of freedom, the mean squared deviations of the substitute

confidence bounds based on the first m order statistics are found as follows: $E[(\theta' - \theta)^2]$ by replacing $\bar{\theta}$ by $\bar{\theta}'$ and n by m in Equation (17); $E[(\underline{\theta}' - \theta)^2]$ by replacing $\bar{\theta}$ by $\underline{\theta}'$, n by m, and P by $1-P$ in Equation (17). Substitution of the results in Equations (15) and (16) then yields the efficiencies of the substitute upper confidence bound and the substitute central confidence interval, respectively, as compared with the conventional bound and interval based on all n observations.

1.4. NUMERICAL EXAMPLE

As an illustration of the use of the above results, consider a simulated life test on forty components. Suppose the observed failure times in hours are as follows:

5	33	55	65	82	102	114	142
10	34	58	65	85	103	116	143
17	36	58	66	90	106	117	151
32	54	61	67	92	107	124	158
32	55	64	68	92	114	139	195

Suppose the experimenter knows that these times are from a Weibull population with shape parameter $K = 2.0$ and wishes to obtain a point estimate and set 80 percent upper and lower confidence bounds on the scale parameter θ. The conventional confidence bounds are those based on all 40 observations, but the experimenter might not want to wait for all the components to fail and might therefore terminate the test at the time of the mth failure ($m < 40$). We can simulate this occurrence by censoring upper portions of the above ordered data. The values of the maximum likelihood estimate $\hat{\theta}$ were calculated from Equation (5) for $m = 8(8)40$, and $\bar{\theta}$ was obtained by multiplying by the unbiasing factor $\bar{\theta}/\hat{\theta}$ given in Table E1. Then the lower and upper 80 percent confidence bounds, $\underline{\theta}_{.80}$ and $\bar{\theta}_{.80}$, were calculated from Equation (14) with the aid of a table of percentage points of the chi-square distribution given by Harter (1964a). The intervals between paired values of $\underline{\theta}_{.80}$ and $\bar{\theta}_{.80}$ are central 60 percent confidence intervals for θ. The efficiencies, E_u and E_i, of upper confidence bounds and central confidence intervals, with confidence levels 80 percent and 60 percent, respectively, based on the first m out of n ordered observations, were calculated by substituting, in Equations (15) and (16), values of $E[(\bar{\theta} - \theta)^2]$ obtained from Equation (17) and of $E[(\bar{\theta}' - \theta)^2]$, $E[(\underline{\theta} - \theta)^2]$, and $E[(\underline{\theta}' - \theta)^2]$ obtained from Equation (17) modified as indicated in subsection 1.3.2. The efficiency E_p of the unbiased point estimator $\bar{\theta}$ was computed as indicated in subsection 1.2.3. The results are as follows:

m	$\hat{\theta}$	θ	$\underline{\theta}_{.80}$	$\bar{\theta}_{.80}$	$E_u(\%)$	$E_i(\%)$	$E_p(\%)$
8	77.0	78.2	68.1	92.2	16.2	18.2	19.8
16	91.9	92.6	83.5	103.3	34.4	38.9	39.8
24	95.2	95.7	88.2	104.8	57.3	59.3	59.9
32	93.7	94.1	87.6	101.7	78.5	79.6	79.9
40	93.3	93.6	87.8	100.3	100.0	100.0	100.0

Note that $E_u \leq E_i \leq E_p \leq 100m/n$ and that $E_u \to E_i \to E_p \to 100m/n \to 100$ percent as $m \to n$.

1.5. REFERENCES

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2. TYPE I EXTREME-VALUE POPULATION WITH KNOWN SCALE PARAMETER*

2.1. INTRODUCTION

Various methods of estimating the parameters of the Type I extreme-value distribution have been proposed. Gumbel (1935, 1941) made an extensive study of the theory and applications of this distribution, and estimated its parameters by the method of moments. Lieblein (1953, 1954) found closed expressions for the variances and covariances of the sample order statistics, tabulated them for samples of size $n = 2(1)6$, and used them to obtain best linear unbiased estimators of the parameters. White (1964) extended Lieblein's table up through $n = 20$ and Mann (1965a) independently extended it up through $n = 25$. Mann (1963, 1965a, b) proposed the use of best linear invariant estimators, which are simple linear functions of the best linear unbiased estimators. Johns and Lieberman (1966) tabulated approximate weights for obtaining best linear invariant estimates from the first m order statistics of samples of size n for $n = 10, 15, 20, 30, 50$, and 100 and four values of m for each n. Mann (1966, 1967) tabulated exact weights for $n = 2(1)25$, $m = 2(1)n$.

Kimball (1946, 1949) obtained maximum-likelihood estimators of the parameters of Type I extreme-value distributions for complete samples, but this method has not been widely used, probably because only iterative solution of the likelihood equations is possible when both parameters are unknown. When the scale parameter is known, however, an explicit expression for the maximum-likelihood estimator of the location parameter and the exact distribution of the estimator can be obtained, not only for complete but also for censored samples. The estimator based on the first m order statistics of a sample of size $n \geq m$ and its exact distribution are worked out in subsection 2.2.1. Expressions are obtained in subsection 2.2.2 for the bias $E = E[(\hat{u}_{mn} \mid b) - u]$ and the variance $V = V(\hat{u}_{mn} \mid b)$ of the maximum-likelihood estimator of the location parameter u when the scale parameter b is known. Numerical values of E/b(6DP) and V/b^2(6DP) are shown in Table E2 for $m = 1(1)100$. The use of the table is discussed in subsection 2.2.3. Exact confidence bounds for the location parameter are given in subsection 2.3. A numerical example is given in subsection 2.4.

2.2. POINT ESTIMATION OF THE LOCATION PARAMETER u

2.2.1. MAXIMUM-LIKELIHOOD ESTIMATOR FOR THE LOCATION PARAMETER

If the random variable T has the two-parameter Weibull distribution with cumulative distribution function $F(t; \theta, K) = 1 - \exp[-(t/\theta)^K]$, where θ is the scale parameter and K is the shape parameter, then the random variable $X = \ln T$ has the Type I extreme-value distribution of smallest values with cumulative distribution function $F(x; u, b) = 1 - \exp\{-\exp[(x-u)/b]\}$, where $u = \ln \theta$ is the location parameter (mode) and $b = 1/K$ is the scale parameter. Harter and Moore (1965) have shown [see subsection 1.2.1 of this chapter] that the maximum-likelihood estimator of θ, based on the first m order statistics t_{in} ($i = 1, 2, \ldots, m$) of a sample of size $n \geq m$ from a Weibull distribution with known shape parameter K, is given by

$$\hat{\theta}_{mn} \mid K = \{[t_{1n}^K + t_{2n}^K + \ldots + t_{mn}^K + (n-m)t_{mn}^K]/m\}^{1/K}. \tag{1}$$

It follows that the maximum-likelihood estimator of u, based on the first m order statistics x_{in} ($i = 1, 2, \ldots, m$) of a sample of size $n \geq m$ from a Type I extreme-value distribution of smallest values with known scale parameter b, is given by

$$\begin{aligned} \hat{u}_{mn} \mid b = \ln \hat{\theta}_{mn} \mid K &= \ln(\{[t_{1n}^K + t_{2n}^K + \ldots + t_{mn}^K + (n-m)t_{mn}^K]/m\}^{1/K}) \\ &= b \ln\{[\exp(x_{1n}/b) + \exp(x_{2n}/b) + \ldots + \exp(x_{mn}/b) + (n-m)\exp(x_{mn}/b)]/m\}. \end{aligned} \tag{2}$$

Harter and Moore (1965) have also shown that the probability density function of the estimator $T_1 = \hat{\theta}_{mn} \mid K$

*An earlier version of this material was published by Harter and Moore (1967).

is independent of n and is given by

$$g_m(t_1) = [K/\Gamma(m)]\{(m/\theta^K)^m t_1^{Km-1} \exp(-m t_1^K/\theta^K),\ t_1 \geq 0. \tag{3}$$

It follows that the probability density function of the estimator $X_1 = \hat{u}_{mn}|b$ is given by

$$\begin{aligned} h_m(x_1) &= [K/\Gamma(m)](m/\theta^K)^m \exp(Kmx_1) \exp[-m\exp(Kx_1)/\theta^K] \\ &= [m^m/b\Gamma(m)] \exp\{m(x_1-u)/b - m\exp[(x_1-u)/b]\}. \end{aligned} \tag{4}$$

Without loss of generality, we may set $u=0$, corresponding to $\theta=1$. Then we have

$$h_m(x_1) = [m^m/b\Gamma(m)] \exp\{m[x_1/b - \exp(x_1/b)]\}. \tag{5}$$

2.2.2. BIAS AND VARIANCE OF MAXIMUM-LIKELIHOOD ESTIMATOR

When the true value of the parameter u is zero, the expected values of x_1 and x_1^2, where $x_1 = \hat{u}_{mn}|b$ is the maximum-likelihood estimator, from the first m order statistics of a sample of size n, of the location parameter u when the scale parameter b is known, are given by

$$E(x_1) = \int_{-\infty}^{\infty} x_1 h_m(x_1) dx_1. \tag{6}$$

$$E(x_1^2) = \int_{-\infty}^{\infty} x_1^2 h_m(x_1) dx_1. \tag{7}$$

where $h_m(x_1)$ is the probability density function of x_1. Substituting in Equations (6) and (7) the value of $h_m(x_1)$ given by Equation (5), we obtain

$$E(x_1) = [1/b\Gamma(m)]m^m \int_{-\infty}^{\infty} x_1 e^{m(x_1/b - e^{x_1/b})} dx_1, \tag{8}$$

$$E(x_1^2) = [1/b\Gamma(m)]m^m \int_{-\infty}^{\infty} x_1^2 e^{m(x_1/b - e^{x_1/b})} dx_1. \tag{9}$$

If we make the substitution $me^{x_1/b} = v$, these become

$$E(x_1) = [b/\Gamma(m)]\left[\int_0^{\infty} e^{-v} v^{m-1} \ln v\, dv - \ln m \int_0^{\infty} e^{-v} v^{m-1} dv\right]. \tag{10}$$

$$E(x_1^2) = [b^2/\Gamma(m)]\left[\int_0^{\infty} e^{-v} v^{m-1} \ln^2 v\, dv - 2\ln m \int_0^{\infty} e^{-v} v^{m-1} \ln v\, dv + \ln^2 m \int_0^{\infty} e^{-v} v^{m-1} dv\right]. \tag{11}$$

which can be expressed in terms of digamma and trigamma functions as

$$E(x_1) = b[\psi(m) - \ln m]. \tag{12}$$

$$E(x_1^2) = b^2\{\psi'(m) + [\psi(m) - \ln m]^2\}. \tag{13}$$

The bias $E = E[(\hat{u}_{mn}|b) - u]$ is equal to the expected value of x_1 when $u=0$, which is given by Equation (12), and the variance $V(\hat{u}_{mn}|b) = V(x_1) = E(x_1^2) - [E(x_1)]^2$ is independent of the true value of u, so we have

$$E = E[(\hat{u}_{mn}|b) - u] = b[\psi(m) - \ln m]. \tag{14}$$

$$V = V(\hat{u}_{mn}|b) = b^2\psi'(m). \tag{15}$$

Six-decimal-place values of E/b and V/b^2 are given in Table E2 for $m = 1(1)100$. The bias and the variance can be read directly from the table when $b = 1$; otherwise, they can be obtained by multiplying the tabular values by b and b^2, respectively.

Asymptotic formulas for E/b and V/b^2, obtained from the well-known asymptotic formulas for the digamma and trigamma functions [see Davis (1964)], are as follows:

$$E/b = -\frac{1}{2m} - \sum_{k=1}^{\infty} \frac{B_{2k}}{2k\, m^{2k}}. \tag{16}$$

$$V/b^2 = \frac{1}{m} + \frac{1}{2m^2} + \sum_{k=1}^{\infty} \frac{B_{2k}}{m^{2k+1}}. \tag{17}$$

where the B's are the Bernoulli numbers. Substituting the first seven Bernoulli numbers of even order in Equations (16) and (17) we find

$$E/b = -\frac{1}{2m} - \frac{1}{12m^2} + \frac{1}{120m^4} - \frac{1}{252m^6} + \frac{1}{240m^8} - \frac{1}{132m^{10}} + \frac{691}{32760m^{12}} - \frac{1}{12m^{14}} + \cdots \tag{18}$$

$$V/b^2 = \frac{1}{m} + \frac{1}{2m^2} + \frac{1}{6m^3} - \frac{1}{30m^5} + \frac{1}{42m^7} - \frac{1}{30m^9} + \frac{5}{66m^{11}} - \frac{691}{2730m^{13}} + \frac{7}{6m^{15}} - \cdots \tag{19}$$

Even for m as small as 10, the absolute value of the truncation error is less than 10^{-6} if one uses only the first two terms of Equation (18) and the first three terms of Equation (19), since in either case it is smaller than the absolute value of the first term neglected.

If $\hat{u}_{mn}|b$ is the maximum-likelihood estimator of u, given b, then $\tilde{u}_{mn}|b = \hat{u}_{mn}|b - E[(\hat{u}_{mn}|b) - u]$ is an unbiased estimator whose variance is the same as that of $\hat{u}_{mn}|b$.

2.2.3. USE OF TABLE

Table E2 may be used to find the bias and the variance of the maximum-likelihood estimator $\hat{u}_{mn}|b$. An unbiased estimate $\tilde{u}_{mn}|b$ may be obtained by subtracting the bias from a maximum-likelihood estimate. The relative efficiency R of unbiased estimators $(\hat{u}_{rn}|b)$ based on the first r order statistics as compared with those $(\tilde{u}_{nn}|b)$ based on the complete sample of size n may be found by taking the ratio of the variance when $m = n$ to that when $m = r$. In addition to its use in the analysis of naturally occurring Type I extreme-value data, Table E2 may also be used in the analysis of Type I extreme-value data obtained by applying a logarithmic transformation to naturally occurring Weibull data, a transformation which Mann (1965b), who considers the case in which K is not known, has advocated. Such a transformation may be applied directly to Weibull data with location parameter zero, or to Weibull data with known location parameter ($\neq 0$) after subtracting the value of the location parameter.

2.3. INTERVAL ESTIMATION OF THE LOCATION PARAMETER u

Harter and Moore (1965) have shown [see subsection 1.3.1 of this chapter] that $2m(\hat{\theta}^K_{mn}|K)/\theta^K$, where $\hat{\theta}_{mn}|K$ is the maximum-likelihood estimator, based on the first m order statistics of a sample of size n, of the scale parameter θ of a Weibull distribution with known shape parameter K, has a chi-square distribution with $2m$ degrees of freedom:

$$2m(\hat{\theta}^K_{mn}|K)/\theta^K = \chi^2_{2m}. \tag{20}$$

It is well known that if the random variable T has the two-parameter Weibull distribution with scale parameter θ and shape parameter K, the random variable $X = \ln T$ has the Type I extreme-value distribution of smallest values with location parameter (mode) $u = \ln \theta$ and scale parameter $b = 1/K$. Hence, in Equation (20), we may set $\theta = \exp u$, $K = 1/b$, and $\hat{\theta}_{mn}|K = \exp \hat{u}_{mn}|b$, which yields

$$2m \exp[(\hat{u}_{mn}|b)/b]/\exp(u/b) = \chi^2_{2m}. \tag{21}$$

Solving for u, we obtain

$$u = b \ln(2m/\chi^2_{2m}) + \hat{u}_{mn}|b. \tag{22}$$

Then an upper confidence bound with confidence level $1-P$ (lower confidence bound with confidence level P) on u is given by

$$\bar{u}_{1-P} = \underline{u}_P = b \ln(2m/\chi^2_{2m,P}) + \hat{u}_{mn}|b. \tag{23}$$

where the first subscript on χ^2 is the number of degrees of freedom and the second one is the cumulative probability. The interval $(\underline{u}_{1-P}, \bar{u}_{1-P})$ is a central confidence interval with confidence level $1-2P$. Numerical confidence bounds may be obtained with the aid of a table of percentage points of the chi-square distribution [see Harter (1964)].

2.4. NUMERICAL EXAMPLE

Consider the following ordered sample of size 40 from a Type I extreme-value distribution with scale parameter $b = 0.5$:

1.609	3.497	4.007	4.174	4.407	4.625	4.736	4.956
2.303	3.526	4.060	4.174	4.443	4.635	4.754	4.963
2.833	3.584	4.060	4.190	4.500	4.663	4.762	5.017
3.466	3.989	4.111	4.205	4.522	4.673	4.820	5.063
3.466	4.007	4.159	4.220	4.522	4.736	4.934	5.273

These data were obtained by taking the natural logarithms of ordered failure times (in hours) in a simulated life test of 40 components whose time-to-failure was known to follow a Weibull distribution with location parameter zero and shape parameter $K = 2.0$ [see subsection 1.4 of this chapter for an analysis of the original data]. Suppose the life test had been terminated at the time of the mth failure, where $m = 8(8)40$. For each value of m, the following computations have been performed: (1) The maximum-likelihood estimate $\hat{u}_{mn}|(b = 0.5)$ has been obtained by the use of Equation (2); (2) the bias E of the maximum-likelihood estimator has been found by multiplying by 0.5 the value of E/b read from Table E2; (3) the unbiased estimate $\tilde{u}_{mn}|b$ has been obtained by subtracting the bias E from $\hat{u}_{mn}|b$; (4) the lower and upper 80 percent confidence bounds $\underline{u}_{.80}$ and $\bar{u}_{.80}$ for the location parameter u have been found by the use of Equation (23) with the aid of a table of percentage points of the chi-square distribution [Harter (1964)]; and (5) the relative efficiency R of $\tilde{u}_{mn}|b$ as compared with $\tilde{u}_{nn}|b$ has been found by taking the ratio of the appropriate values read from the variance column of Table E2. The results are summarized below:

m	$\hat{u}_{mn}\|b$	E(bias)	$\tilde{u}_{mn}\|b$	$\underline{u}_{.80}$	$\bar{u}_{.80}$	R(%)
8	4.344	−0.032	4.376	4.221	4.524	19.0
16	4.521	−0.016	4.537	4.429	4.641	39.3
24	4.556	−0.010	4.566	4.479	4.652	59.5
32	4.541	−0.008	4.549	4.474	4.624	79.7
40	4.537	−0.006	4.543	4.476	4.610	100.0

In comparing these results with those of the analysis of the original data, the reader will note that (except for discrepancies due to rounding), $\hat{u}_{mn} \mid b \equiv \ln \hat{\theta}_{mn} \mid K$, $\underline{u}_{.80} \equiv \ln \underline{\theta}_{.80}$, and $\bar{u}_{.80} \equiv \ln \bar{\theta}_{.80}$, while $\tilde{u}_{mn} \mid b \doteq \ln \tilde{\theta}_{mn} \mid K$, where $\tilde{\theta}_{mn}|K$ is an unbiased estimate obtained from the biased estimate $\hat{\theta}_{mn}|K$. The corresponding relative efficiencies are also approximately equal, but not identical.

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3. TYPE II EXTREME-VALUE POPULATIONS WITH KNOWN SHAPE PARAMETERS*

3.1. INTRODUCTION

Fisher and Tippett (1928) showed that the asymptotic distribution of the largest (or smallest) value in a sample of size n, as $n \to \infty$, for any population satisfying certain regularity conditions, must fall into one of three types. The populations possessing asymptotic distributions of the largest value were classified by von Mises (1936), who also gave sufficient conditions for the validity of the three asymptotic distributions. Later Gnedenko (1943) gave necessary and sufficient conditions. Gumbel (1958) made an extensive study of the theory of the three asymptotic distributions and of their applications. Goldstein (1963) tabled random numbers from the three asymptotic distributions of largest values. This section deals with the Type II extreme-value distributions, which have received less attention than the other types.

Fréchet (1927) derived the Type II asymptotic distribution of largest values. Gumbel (1958, 1965) presented several methods of estimating the parameters of the Type II extreme-value distributions. In subsection 3.2.1 of this chapter, conditional maximum-likelihood estimators, $\hat{v}_n|K$ and $\hat{v}_1|K$, for the scale parameters of the Type II asymptotic distributions of largest values (for samples censored from below) and of smallest values (for samples censored from above), both with known shape parameter K, are derived, together with their distributions. Unbiased estimators, $\tilde{v}_n|K$ and $\tilde{v}_1|K$, and their variances are derived in subsection 3.2.2. The Cramér-Rao lower bound for the variance of an unbiased estimator is derived in subsection 3.2.3. Numerical values of the unbiasing factors, the variances of the unbiased estimators, and their efficiency relative to the Cramér-Rao lower bound are shown in Table E3. In subsection 3.3 a simple technique for obtaining exact upper and lower confidence bounds for the scale parameters is presented. A numerical example which illustrates the computation of both point and interval estimates is given in subsection 3.4. Some remarks on applications are made in subsection 3.5.

3.2. POINT ESTIMATION OF THE SCALE PARAMETERS v_n AND v_1

3.2.1. MAXIMUM-LIKELIHOOD ESTIMATORS OF THE SCALE PARAMETERS

Epstein and Sobel (1953) derived an estimator, $\hat{\theta}$, for the scale parameter θ of the exponential distribution for samples censored from above and showed that it is maximum likelihood, sufficient, unbiased, and minimum variance. Their "best" m-order-statistic estimator is given by

$$\hat{\theta}_{mn}=[t_{1n}+t_{2n}+\ \ldots\ +t_{mn}+(n-m)t_{mn}]/m. \tag{1}$$

where $t_{in}(i=1, 2, \ldots, m)$ is the ith order statistic of a sample of size n from a one-parameter negative exponential distribution. The probability density function of the random variable $S=\hat{\theta}_{mn}$ is given by Epstein and Sobel (1953) as

$$f_m(s)=\begin{cases}[1/\Gamma(m)](m/\theta)^m s^{m-1}\exp(-ms/\theta), & s>0,\\ 0 \text{ elsewhere.}\end{cases} \tag{2}$$

a. Type II Asymptotic Distribution of Largest Values

If the random variable T has an exponential distribution with scale parameter θ and location parameter zero, then the random variable $Y=T^{-1/K}$ has the Type II asymptotic distribution of largest values with scale parameter $v_n=\theta^{-1/K}$, shape parameter K, and location parameter zero, given by

$$F_1(y;\, v_n, K)=\exp[-(y/v_n)^{-K}], \qquad y>0,\ v_n>0, \text{ and } K>0. \tag{3}$$

*An earlier version of this material was published by Harter and Moore (1968).

By use of Equation (1), we obtain the following m-order-statistic estimator of v_n given K:

$$\hat{v}_n|K = \hat{\theta}_{mn}^{1/K} = \{[t_{1n} + t_{2n} + \cdots + t_{mn} + (n-m)t_{mn}]/m\}^{-1/K}$$

$$= \{m/[y_{nn}^K + y_{n-1,n}^K + \cdots + y_{n-m+1,n}^K + (n-m)y_{n-m+1,n}^K]\}^{1/K}. \tag{4}$$

where t_{in} and $y_{n-i+1,n}(i = 1, 2, \ldots, m)$ are the ith smallest and ith largest observations, respectively, in samples of size n from the exponential distribution and the Type II asymptotic distribution of largest values. Then $\hat{v}_n|K$ is a maximum-likelihood estimator of the scale parameter, v_n, of the Type II asymptotic distribution of largest values, since $v_n = \theta^{-1/K}$ and $\hat{\theta}_{mn}$ is a maximum-likelihood estimator of the scale parameter θ of the exponential distribution. Now we let $\hat{v}_n|K = \hat{\theta}_{mn}^{1/K}$ or $Z = S^{-1/K}$ and $v_n = \theta^{-1/K}$ in Equation (2), and we obtain the following expression for the probability density function of $Z = \hat{v}_n|K$:

$$g_m(z) = \begin{cases} K[1/\Gamma(m)][mv_n^K]^m z^{-mK-1} \exp[-m(v_n/z)^K], & z > 0, \\ 0 \text{ elsewhere.} \end{cases} \tag{5}$$

b. Type II Asymptotic Distribution of Smallest Values

If the random variable T has an exponential distribution with scale parameter θ and location parameter zero, then the random variable $X = -T^{-1/K}$ has the Type II asymptotic distribution of smallest values with scale parameter $v_1 = -\theta^{-1/K}$, shape parameter K, and location parameter zero, given by

$$F_2(x; v_1, K) = 1 - \exp[-(x/v_1)^{-K}], \qquad x < 0, v_1 < 0, \text{ and } K > 0. \tag{6}$$

We can use the symmetry with the distribution of largest values to obtain a maximum-likelihood estimator of the scale parameter v_1. We have $v_1 = -v_n$ and hence $\hat{v}_1|K = -\hat{v}_n|K$; but $y_{n-i+1,n} = -x_{in}(i = 1, 2, \ldots, m)$, and therefore we find the maximum-likelihood estimator of v_1 given K to be

$$\hat{v}_1|K = -\{m/[(-x_{1n})^{-K} + (-x_{2n})^{-K} + \cdots + (-x_{mn})^{-K} + (n-m)(-x_{mn})^{-K}]\}^{1/K}. \tag{7}$$

where $x_{in}(i = 1, 2, \ldots, m)$ is the ith order statistic of a sample of size n from the Type II asymptotic distribution of smallest values. Now we let $u = -z$ and $v_1 = -v_n$ in Equation (5), and we find the probability density function of $U = \hat{v}_1|K$ to be

$$h_m(u) = \begin{cases} K[1/\Gamma(m)][m(-v_1)^K]^m[-u]^{-mK-1} \exp[-m(v_1/u)^K], & u < 0, \\ 0 \text{ elsewhere.} \end{cases} \tag{8}$$

If we have a Type II asymptotic distribution of largest or smallest values with known shape parameter and known location parameter different from zero, then we can transform the original sample to a sample from the corresponding distribution with location parameter zero and proceed with the estimation as outlined in (a) or (b) above.

3.2.2. UNBIASED ESTIMATORS AND THEIR VARIANCES

The expected value and the variance of the estimator $\hat{v}_n|K$ are found by using Equation (5) and the transformation of variables $z = (w/m)^{-1/K}v_n$ to be

$$E(\hat{v}_n|K) = v_n m^{1/K}\Gamma(m - 1/K)/\Gamma(m), \qquad (m - 1/K) > 0, \tag{9}$$

and

$$\text{var}(\hat{v}_n|K) = v_n^2 m^{2/K}\{\Gamma(m)\Gamma(m - 2/K) - [\Gamma(m - 1/K)]^2\}/[\Gamma(m)]^2, \quad (m - 2/K) > 0. \tag{10}$$

An unbiased estimator of the scale parameter is given by

$$\tilde{v}_n|K = [\Gamma(m)/m^{1/K}\Gamma(m-1/K)]\hat{v}_n|K, \qquad (m-1/K) > 0 \tag{11}$$

and its variance is given by

$$\text{var}\,(\tilde{v}_n|K) = v_n^2\{\Gamma(m)\Gamma(m-2/K) - [\Gamma(m-1/K)]^2\}/[\Gamma(m-1/K)]^2, \qquad (m-2/K) > 0. \tag{12}$$

The expected value and the variance of the maximum-likelihood estimator of the scale parameter v_1 of the Type II asymptotic distribution of smallest values and the corresponding unbiased estimator and its variance are found by replacing v_n by v_1, $\hat{v}_n$ by $\hat{v}_1$, and $\tilde{v}_n$ by $\tilde{v}_1$ in equations (9), (10), (11), and (12) respectively.

3.2.3. CRAMÉR-RAO LOWER BOUND

The Cramér-Rao lower bound for the variance of an unbiased estimator of a parameter ϕ is $-1/E(\partial^2 \ln L/\partial\phi^2)$, where L is the likelihood function. Let $y_{nn}, y_{n-1,n}, \ldots, y_{n-m+1,n}$ be the m largest observations in a sample of size n from a Type II asymptotic distribution of largest values with scale parameter v_n and shape parameter K. The natural logarithm of the likelihood function $L = L(y_{nn}, y_{n-1,n}, \ldots, y_{n-m+1,n}; v_n, K)$ of the censored sample is given by

$$\ln L = \ln n! - \ln(n-m)! \sum_{i=1}^{m} \ln(K/y_{n-i+1,n}) + K\sum_{i=1}^{m} \ln(v_n/y_{n-i+1,n}) - \sum_{i=1}^{m} (v_n/y_{n-i+1,n})^K - (n-m)(v_n/y_{n-m+1,n})^K \tag{13}$$

and its first two derivatives with respect to the parameter v_n by

$$\partial \ln L/\partial v_n = mK[1/v_n - v_n^{K-1}(\hat{v}_n|K)^{-K}]. \tag{14}$$

$$\partial^2 \ln L/\partial v_n^2 = -mK[1/v_n^2 + (K-1)v_n^{K-2}(\hat{v}_n|K)^{-K}]. \tag{15}$$

where $\hat{v}_n|K$ is given by Equation (4). The expected value of the second partial derivative is

$$E(\partial^2 \ln L/\partial v_n^2) = -mK\{1/v_n^2 + (K-1)v_n^{K-2}E[(\hat{v}_n|K)^{-K}]\} = -mK^2/v_n^2, \tag{16}$$

since $E[(\hat{v}_n|K)^{-K}] = E(\hat{\theta}) = \theta = v_n^K$, $\hat{\theta}$ being an unbiased estimator of θ. Hence the Cramér-Rao lower bound for the variance of an unbiased estimator, based on the last m order statistics of a sample of size $n \geq m$, of the scale parameter v_n of a Type II asymptotic distribution of largest values is v_n^2/mK^2. Similarly, the Cramér-Rao lower bound for the variance of an unbiased estimator, based on the first m order statistics of a sample of size $n \geq m$, of the scale parameter v_1 of a Type II asymptotic distribution of smallest values is v_1^2/mK^2.

Table E3 gives numerical values of the unbiasing factor $\tilde{v}|K/\hat{v}|K$, the variance of the unbiased estimator $\tilde{v}|K$, and the efficiency (%) of the unbiased estimator relative to the Cramér-Rao lower bound, all for $m = 1(1)100$, $K = 0.5(0.5)4.0(1.0)8.0$, where v may be either v_n or v_1.

3.3. INTERVAL ESTIMATION OF THE SCALE PARAMETERS v_n AND v_1

Epstein and Sobel (1953) have shown that $2m\hat{\theta}_{mn}/\theta$ has a chi-square distribution with $2m$ degrees of freedom:

$$2m\,\hat{\theta}_{mn}/\theta = \chi^2_{2m}. \tag{17}$$

Making the transformation of random variables, discussed in subsection 3.2.1, from the exponential distribution to the Type II asymptotic distribution of largest values, we set $\theta = v_n^{-K}$ and $\hat{\theta}_{mn} = (\hat{v}_n|K)^{-K}$ in Equation (17) and obtain

$$2m(v_n/\hat{v}_n|K)^K = \chi^2_{2m} \tag{18}$$

or

$$v_u = \hat{v}_u|K/(\chi^2_{2m}/2m)^{1/K}. \tag{19}$$

Then an upper confidence bound with confidence level $1-P$ (lower confidence bound with confidence level P) on v_u is given by

$$\overline{v}_{u,1-P} = \underline{v}_{u,P} = \hat{v}_u|K/(\chi^2_{2m,P}/2m)^{1/K}. \tag{20}$$

where the first subscript on χ^2 is the number of degrees of freedom and the second is the cumulative probability.

For the Type II asymptotic distribution of smallest values, we make use of the symmetry with the distribution of largest values and let $v_1 = -v_u$ and $\hat{v}_1|K = -\hat{v}_u|K$ in equation (19), which yields

$$v_1 = \hat{v}_1|K/(\chi^2_{2m}/2m)^{1/K}. \tag{21}$$

Then an upper confidence bound with confidence level P (lower confidence bound with confidence level $1-P$) on v_1 is given by

$$\overline{v}_{1,P} = \underline{v}_{1,1-P} = \hat{v}_1|K/(\chi^2_{2m,P}/2m)^{1/K}. \tag{22}$$

The intervals $(\underline{v}_{u,1-P}, \overline{v}_{u,1-P})$ and $(\underline{v}_{1,1-P}, \overline{v}_{1,1-P})$ are central confidence intervals with confidence levels $1-2P$. Numerical confidence bounds may be obtained with the aid of a table of percentage points of the chi-square distribution [see, for example, Harter (1964)].

3.4. NUMERICAL EXAMPLE

The following ordered pseudo-random sample of size 40 was drawn from a Type II asymptotic distribution of largest values with location parameter $\epsilon = 0$ [omitted from Equations (3)–(5)], scale parameter (characteristic largest value) $v_u = 1$, and shape parameter $K = 2$:

0.4409	0.6592	0.7695	0.8960	1.0203	1.2639	1.8244	2.6122
0.4669	0.6730	0.7815	0.9031	1.1049	1.3515	1.8397	4.7915
0.5468	0.6872	0.8199	0.9209	1.1320	1.5679	1.9473	5.1470
0.6099	0.7037	0.8648	0.9566	1.1377	1.7585	2.2080	5.4795
0.6332	0.7452	0.8913	0.9676	1.1406	1.8116	2.3687	6.1992

Assuming that the value of K is known and that ϵ is known to be zero, the maximum-likelihood estimator of v_u, based on the last m order statistics (m largest sample values) of a sample of size n, is given by Equation (4) and exact confidence bounds can be obtained from Equation (20). An unbiased estimator is given by Equation (11). These calculations for the above sample of size $n = 40$ have been performed for $m = 8(8)40$, with the following results:

m	$\hat{v}_u\|K$	$\tilde{v}_u\|K$	$\underline{v}_{u,.80}$	$\overline{v}_{u,.80}$
8	0.9239	0.8798	0.7713	1.0449
16	0.8349	0.8152	0.7401	0.9153
24	0.8657	0.8521	0.7865	0.9350
32	0.8831	0.8727	0.8137	0.9449
40	0.8965	0.8881	0.8339	0.9530

where $\hat{v}_u|K$ is the maximum-likelihood point estimate, $\tilde{v}_u|K$ is the corresponding unbiased estimate, and $\underline{v}_{u,.80}$ and $\overline{v}_{u,.80}$ are the lower and upper exact confidence bounds, based on the m largest values in the sample. The rows of the above table are not independent, since they are all based on the same sample (with different amounts of censoring).

3.5. REMARKS ON APPLICATIONS

The Type II asymptotic distribution of largest values, which is restricted to positive values, has been used by Thom (1954) in a study of maximum wind speed, by Jenkinson (1955), Bernier (1957, 1959), and Gumbel, Benham, and Thomson (1959) in studies of floods on rivers, and by Jenkinson (1955) in a study of maximum rainfalls. This distribution is likely to find application also in life testing problems. Unfortunately, the method of estimating the scale parameter (characteristic largest value) proposed in this section cannot be used when a life test is terminated before all of the items placed on test have failed, since this method permits only single censoring from below, not from above. Substitute point and interval estimators, based on one order statistic, have, however, been worked out by Moore and Harter (1967) [see Chapter VI, Section 3 of the present volume], and can be used in cases of censoring from above.

Applications of the Type II asymptotic distribution of smallest values, which is restricted to negative values, are not so immediately apparent, but one possible application is to extremes of drought (river stages below low water mark).

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4. PARETO AND LIMITED POPULATIONS WITH KNOWN LOCATION PARAMETERS*

4.1. INTRODUCTION

The Pareto distribution was used by Pareto (1897) as a law to describe the distribution of income. Mandelbrot (1960) discussed various models, including various versions of the Pareto law, of an important class of economic quantities including "income". Steindl (1965) showed that numerous economic mechanisms lead, in the limit and with appropriate boundary conditions, to the Pareto distribution. Malik (1966) presented a method of estimating the parameters of the Pareto distribution from complete samples. Muniruzzaman (1951) considered conditional estimation of and testing hypotheses concerning one of the parameters of the Pareto distribution by the method of maximum likelihood from complete samples. When the location parameter is known, however, explicit expressions for the maximum-likelihood estimators of the shape parameters of the Pareto distribution and of a related limited distribution defined by Gumbel (1958, p. 157), $\hat{K}_{mn}|\epsilon$ and $\hat{K}_{mn}|\omega$, as well as the exact distribution of the estimators, can be obtained, not only for complete but also for censored samples. The estimators based on the first m order statistics of a sample of size $n \geq m$ and their exact distribution are worked out in subsection 4.2.1. Expressions are obtained in subsection 4.2.2 for the expected values of the maximum-likelihood estimators, which are used to obtain unbiased estimators, $\tilde{K}_{mn}|\epsilon$ and $\tilde{K}_{mn}|\omega$, and for the variances of the unbiased estimators. The Cramér-Rao lower bounds for the variances of the unbiased estimators are derived in subsection 4.2.3. Exact confidence bounds for the shape parameters are given in subsection 4.3. In subsection 4.4 numerical examples, which illustrate the computation of both point and interval estimates, are given.

4.2. POINT ESTIMATION OF THE SHAPE PARAMETERS K

4.2.1. MAXIMUM-LIKELIHOOD ESTIMATORS OF THE SHAPE PARAMETERS

Epstein and Sobel (1953) derived an estimator, $\hat{\theta}$, for the scale parameter of the exponential distribution for samples censored from above and showed that it is maximum likelihood, sufficient, unbiased and minimum variance. Their "best" m-order-statistic estimator is given by

$$\hat{\theta}_{mn} = [t_{1n} + t_{2n} + \ldots + t_{mn} + (n-m)t_{mn}]/m \tag{1}$$

where t_{in} $(i = 1, \ldots, m)$ is the ith order statistic of a sample of size n from an exponential distribution.

The probability density function of the random variable $S = \hat{\theta}_{mn}$ is given by Epstein and Sobel as

$$f_m(s) = \begin{cases} [1/\Gamma(m)](m/\theta)^m s^{m-1} \exp(-ms/\theta), & s > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{2}$$

a. Pareto distribution

If T has an exponential distribution with scale parameter θ and location parameter zero, then $Y = \exp T + \epsilon$ has the Pareto distribution, as shown by Gumbel (1958, p. 157), with location parameter ϵ, shape parameter $K = 1/\theta$, and cumulative distribution function

$$F_1(y; \epsilon, K) = 1 - (y-\epsilon)^{-K}, \qquad (y \geq 1+\epsilon, K > 0). \tag{3}$$

Therefore an m-order-statistic estimator of K given ϵ is obtained by using Equation (1), as follows

$$\hat{K}|\epsilon = 1/\hat{\theta} = m/[t_{1n} + \ldots + t_{mn} + (n-m)t_{mn}] = m/[\ln(y_{1n}-\epsilon) + \ldots + \ln(y_{mn}-\epsilon) + (n-m)\ln(y_{mn}-\epsilon)], \tag{4}$$

where t_{in}, $y_{in} (i = 1, 2, \ldots, m)$ are the ith order statistics from samples of size n from the exponential and Pareto distributions, respectively. Now $\hat{K}|\epsilon$ is a maximum-likelihood estimator of the shape parameter,

*An earlier version of this material was published by Moore and Harter (1969).

K, of the Pareto distribution, since $K = 1/\theta$ and $\hat{\theta}$ is a maximum-likelihood estimator of the scale parame r, θ, of the exponential distribution.

Now let $\hat{K}_{mn}|\epsilon = 1/\hat{\theta}_{mn}$ or $U = 1/S$ and $K = 1/\theta$ in Equation (2) and we find the probability density of $U = \hat{K}_{mn}|\epsilon$ to be the inverted Gamma density function $g_m(u)$ as given by

$$g_m(u) = \begin{cases} [1/\Gamma(m)](mK)^m u^{-(m+1)} \exp(-mK/u), & u > 0 \\ 0 \text{ elsewhere.} \end{cases} \tag{5}$$

The Pareto distribution (strong Pareto law) is given in a slightly different form by Mandelbrot (1960) as follows:

$$F_3(y;\ y_0,\ K) = 1 - (y/y_0)^{-\alpha}, \qquad y > y_0 > 0. \tag{6}$$

Mandelbrot has assumed that $\epsilon = 0$ and we have assumed that $y_0 = 1$. The estimator $\hat{\alpha}|y_0$ has the same properties as the estimator $\hat{K}|\epsilon$ except that it is given by the following formula:

$$\hat{\alpha}|y_0 = m/[\ln(y_{1n}/y_0) + \ldots + \ln(y_{mn}/y_0) + (n-m)\ln(y_{mn}/y_0)]. \tag{7}$$

b. Limited Distribution

If T has an exponential distribution with scale parameter θ and location parameter zero then $X = \omega - \exp(-T)$ has the limited distribution, as shown by Gumbel (1958, p. 157), with location parameter ϵ, shape parameter $K = 1/\theta$ and cumulative distribution function

$$F_2(x;\ \omega,\ K) = 1 - (\omega - x)^K, \qquad (\omega - 1 \leq x \leq \omega,\ K > 0). \tag{8}$$

Therefore an m-order-statistic estimator of K given ω is obtained by using Equation (1), as follows:

$$\hat{K}_{mn}|\omega = 1/\hat{\theta}_{mn} = m/[t_{1n} + \ldots + t_{mn} + (n-m)t_{mn}] = -m/[\ln(\omega - x_{1n}) + \ldots + \ln(\omega - x_{mn}) + (n-m)\ln(\omega - x_{mn})], \tag{9}$$

where t_{in}, x_{in} $(i = 1, \ldots, m)$ are the ith order statistics from samples of size n from the exponential and limited distributions, respectively. Now $\hat{K}_{mn}|\omega$ is a maximum-likelihood estimator of the shape parameter, K, of the limited distribution, since $K = 1/\theta$ and $\hat{\theta}_{mn}$ is a maximum-likelihood estimator for θ.

Now let $\hat{K}_{mn} = 1/\hat{\theta}_{mn}$ or $U = 1/S$ and $K = 1/\theta$ in Equation (2) and we find the probability density of $U = \hat{K}_{mn}|\omega$ to be given by Equation (5) above.

4.2.2. UNBIASED ESTIMATORS AND THEIR VARIANCES

The expected values and variances of $\hat{K}_{mn}|\epsilon$ and $\hat{K}_{mn}|\omega$ are found, by use of Equation (5) and the transformation $Z = mK/U$ to be

$$E(\hat{K}_{mn}) = [m/(m-1)]K, \qquad m > 1, \tag{10}$$

and

$$\text{var}(\hat{K}_{mn}) = [m^2/(m-1)^2(m-2)]K^2, \qquad m > 2. \tag{11}$$

Hence unbiased estimators of $K\ (m > 1)$ are given by

$$\tilde{K}_{mn}|\epsilon = [(m-1)/m](\hat{K}_{mn}|\epsilon) \tag{12}$$

and

$$\tilde{K}_{mn}|\omega = [(m-1)/m](\hat{K}_{mn}|\omega). \tag{13}$$

The variance of the unbiased estimators given by Equations (12) and (13) is found to be

$$\text{var } (\tilde{K}_{mn}) = K^2/(m-2), \qquad m > 2. \tag{14}$$

4.2.3. CRAMÉR-RAO LOWER BOUNDS

The Cramér-Rao lower bound for the variances of unbiased estimators of the parameter K is $-1/E[\partial^2 \ln L/\partial K^2]$, where L is the likelihood function. The likelihood functions for the Pareto and limited distributions are as follows

$$L_1 = [n!/(n-m)!]K^m(y_{1n}-\epsilon)^{-K-1} \cdot \cdot \cdot (y_{mn}-\epsilon)^{-K-1}(y_{mn}-\epsilon)^{-K(n-m)}, \tag{15}$$

$$L_2 = [n!/(n-m)!]K^m(\omega-x_{1n})^{K-1} \cdot \cdot \cdot (\omega-x_{mn})^{K-1}(\omega-x_{mn})^{K(n-m)}. \tag{16}$$

The first two derivatives of L_1 and L_2 with respect to the parameter K, after substitution of $\hat{K}|\epsilon$ or $\hat{K}|\omega$ for its equivalent expression, are as follows

$$\partial \ln L_1/\partial K = m/K - m/\hat{K}|\epsilon, \tag{17}$$

$$\partial \ln L_2/\partial K = m/K - m/\hat{K}|\omega, \tag{18}$$

$$\partial^2 \ln L_1/\partial K^2 = -m/K^2, \tag{19}$$

$$\partial^2 \ln L_2/\partial K^2 = -m/K^2. \tag{20}$$

Hence the expected values of $\partial^2 \ln L/\partial K^2$ are both $-m/K^2$, the Cramér-Rao lower bound is given by K^2/m and the relative efficiency of the unbiased estimators given by Equations (12) and (13) is $(m-2)/m$, $m > 2$. It should be noted that the variances of the estimators and also the Cramér-Rao lower bounds are the same for any $n \geq m$.

4.3. INTERVAL ESTIMATION OF THE SHAPE PARAMETERS K

Epstein and Sobel (1953) have shown that $2m\ \hat{\theta}_{mn}/\theta$ has a chi-square distribution with $2m$ degrees of freedom

$$2m\hat{\theta}_{mn}/\theta = \chi^2_{2m}. \tag{21}$$

Making the transformations of random variables, discussed in subsection 4.2.1, from the Pareto distribution to the exponential distribution and setting $K = 1/\theta$ and $\hat{K}_{mn}|\epsilon = 1/\hat{\theta}_{mn}$ in Equation (21) we obtain

$$2mK/(\hat{K}_{mn}|\epsilon) = \chi^2_{2m}. \tag{22}$$

Solving for K, we obtain

$$K = (\hat{K}_{mn}|\epsilon)\chi^2_{2m}/2m. \tag{23}$$

Then an upper confidence bound with confidence P (lower confidence bound with confidence $1-P$) on the shape parameter K of a Pareto distribution is given by

$$\underline{K}_{1-P} = \bar{K}_P = (\hat{K}_{mn}|\epsilon)\chi^2_{2m,\,P}/2m. \tag{24}$$

The interval $(\underline{K}_{1-P}, \bar{K}_{1-P})$ is a central confidence interval with confidence level $1-2P$. Numerical confidence bounds may be obtained with the aid of a table of percentage points of the chi-square distribution [see Harter (1964)]. Confidence bounds for the shape parameter K of a limited distribution may be found exactly the same way as above since the distribution of the estimator and the functional relationships are identical if we replace $\hat{K}_{mn}|\epsilon$ by $\hat{K}_{mn}|\omega$.

Example 1. The following ordered pseudo-random sample of size 40 was drawn from a Pareto distribution with parameters $\epsilon = 0$ and $K = 1$:

1.0518	1.2526	1.3995	1.6715	2.3107	3.3146	4.7971	10.9258
1.0534	1.3604	1.4715	1.9564	2.3611	3.7712	5.1568	11.1492
1.1158	1.3662	1.4767	2.0622	2.4993	3.9670	5.1841	14.7554
1.1382	1.3786	1.4889	2.1212	2.6975	4.1188	7.1695	15.9696
1.1859	1.3932	1.5929	2.2638	2.8309	4.4773	8.0258	17.8400

If we assume that the value of ϵ is known, the maximum-likelihood estimator of K, based on the first m order statistics of a sample of size n, is given by Equation (4), the unbiased estimator is given by Equation (12), and exact confidence bounds can be obtained from Equation (24). These calculations for the above sample of size $n = 40$ have been performed for $m = 8(8)40$, with the following results:

m	$\hat{K}_{mn}\|\epsilon$	$\tilde{K}_{mn}\|\epsilon$	$\underline{K}_{.80}$	$\bar{K}_{.80}$
8	0.7054	0.6172	0.4917	0.9023
16	0.9508	0.8914	0.7472	1.1429
24	0.8907	0.8536	0.7352	1.0390
32	0.9076	0.8792	0.7706	1.0392
40	0.9761	0.9517	0.8444	1.1031

where $\hat{K}_{mn}|\epsilon$ is the maximum-likelihood point estimate, $\tilde{K}_{mn}|\epsilon$ is the corresponding unbiased estimate, and $\underline{K}_{.80}$ and $\bar{K}_{.80}$ are the lower and upper exact 80 percent confidence bounds, based on the first m order statistics of the above sample.

Example 2. The following ordered pseudo-random sample of size 40 was drawn from a limited distribution with parameters $\omega = 1$ and $K = 1$:

0.0006	0.1547	0.2854	0.3935	0.4963	0.6211	0.7703	0.8634
0.0117	0.1645	0.2865	0.3964	0.5535	0.6371	0.8145	0.8821
0.0962	*0.1994*	*0.3212*	*0.4372*	*0.5600*	*0.6807*	*0.8214*	*0.9219*
0.1029	0.2281	0.3532	0.4526	0.5970	0.6835	0.8480	0.9648
0.1186	0.2390	0.3923	0.4888	0.5995	0.7682	0.8632	0.9970

If we assume that the value of ω is known, the maximum-likelihood estimator of K, based on the first m order statistics of a sample of size n, is given by Equation (9), the unbiased estimator is given by Equation (13), and exact confidence bounds can be obtained from Equation (24), with $\hat{K}_{mn}|\epsilon$ replaced by $\hat{K}_{mn}|\omega$, with the aid of a table of percentage points of the chi-square distribution [see, for example, Harter (1964)]. These calculations for the above sample of size $n = 40$ have been performed for $m = 8(8)40$, with the following results:

m	$\hat{K}_{mn}\|\omega$	$\tilde{K}_{mn}\|\omega$	$\underline{K}_{.80}$	$\bar{K}_{.80}$
8	0.9956	0.8712	0.6940	1.2735
16	1.0033	0.9406	0.7885	1.2060
24	0.9975	0.9559	0.8233	1.1636
32	0.9754	0.9449	0.8281	1.1168
40	0.9814	0.9569	0.8490	1.1090

where $\hat{K}_{mn}|\omega$ is the maximum-likelihood point estimate, $\tilde{K}_{mn}|\omega$ is the corresponding unbiased estimate, and $\underline{K}_{.80}$ and $\bar{K}_{.80}$ are the lower and upper exact 80 percent confidence bounds, based on the first m order statistics of the above sample.

The random variable X having the limited distribution is restricted to the interval $\omega - 1 \leq x \leq \omega$. If one takes $\omega = 1$, as in the above example, values of x are restricted to the interval $[0, 1]$. If one takes $K = 1$, as in the above example, the distribution is uniform, but the estimation procedure works equally well for more general true values of the parameter K.

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CHAPTER VI

SINGLE ORDER STATISTICS FROM POPULATIONS RELATED TO THE EXPONENTIAL

1. WEIBULL POPULATION WITH KNOWN LOCATION AND SHAPE PARAMETERS*

1.1. INTRODUCTION

In Chapter V, Section 1, a discussion has been given of point and interval estimators, derived by Harter and Moore (1965), of the scale parameter of a Weibull population with known location and shape parameters, based on the first m of n ordered observations. However, in many practical applications, less efficient estimators, based on one order statistic, may be chosen because of their inherent simplicity. In this section, use is made of the relationship between exponential and Weibull populations to obtain point and interval estimators, based on one order statistic. This is accomplished by applying a suitable transformation to the corresponding point and interval estimators for the parameter of a one-parameter exponential population as discussed in Chapter IV and tabulated in Tables D2 and D4, respectively. The resulting point estimator, which is consistent but biased, is compared with an unbiased estimator obtained by Quayle (1963). Results are reported of a Monte Carlo study of the ratio of the mean square errors of estimators based on m order statistics and on one order statistic. The use of Table D2 to compute a consistent estimate for the scale parameter of a Weibull population with known location and shape parameters and the use of Table D4 to compute exact confidence bounds for the Weibull scale parameter are discussed. A numerical example is given of the computation of both point and interval estimates.

1.2. POINT ESTIMATION OF THE SCALE PARAMETER θ

1.2.1. A BIASED ESTIMATOR BASED ON ONE ORDER STATISTIC

Harter (1961) tabulated the minimum-variance unbiased one-order-statistic estimator of the parameter of a one-parameter exponential population from a complete sample of size $n = 1(1)100$. An unbiased estimator of the parameter σ was given by Epstein and Sobel (1953) [see Chapter IV, subsection 1.2.1 of the present volume] as

$$\tilde{\sigma}_k = c_k x_k, \qquad (k = 1, 2, \ldots, n) \tag{1}$$

with

$$c_k = 1/\sum_{1}^{k} a_i \tag{2}$$

and

$$a_i = 1/(n - i + 1). \tag{3}$$

For each value of n, the coefficient c_k and the estimator variance and efficiency were tabulated for $k = r$, where r is that value of k which minimizes the estimator variance. The resulting table is included as Table D1 of the present volume. For a censored sample in which one knows only the first m of the ordered sample values, as in a life test which is terminated at the time of the mth failure, the most efficient estimator is given by Equation (1), where $k = \min\ (m, r)$. The coefficients $c_k = c(k, n)$ and the efficiency relative to the m-order-statistic estimator are given in Table D2 for $n = 1(1)40$ and $m = 1(1)n$.

The Weibull density function is given by

$$f(y) = (K/\theta)(y/\theta)^{K-1} \exp\ [-(y/\theta)^K], \qquad (y \geq 0;\ \theta, K > 0) \tag{4}$$

where the shape parameter K is assumed to be known and the location parameter to be zero. (If the location parameter is known, but not equal to zero, one can transform the data by subtracting the known value

*Earlier versions of portions of this material were published by Moore and Harter (1965, 1966).

of the location parameter, so the latter assumption involves no loss of generality.) Making the change of variable $x = y^K$, we obtain

$$g(x) = \exp(-x/\theta^K)/\theta^K, \tag{5}$$

which is the familiar exponential density function with parameter $\sigma = \theta^K$, for which an unbiased estimator is given by

$$\tilde{\sigma}_k = c_k x_k = c_k y_k^K, \tag{6}$$

where x_k and y_k are the kth order statistics of samples of size n from an exponential population and from a Weibull population with shape parameter K, respectively. Taking the Kth root of the extreme members of Equation (6), we get

$$\tilde{\sigma}_k^{1/K} = c_k^{1/K} y_k = \tilde{\theta}_k. \tag{7}$$

Now $\tilde{\theta}_k$ is a consistent estimator for θ, the parameter of the Weibull population, since $\sigma = \theta^K$ and $\tilde{\sigma}_k$ is a consistent estimator of the parameter σ of the exponential population.

1.2.2. COMPARISON WITH AN UNBIASED ESTIMATOR

Quayle (1963) obtained the unbiased estimator, based on one order statistic of a sample of size n for the scale parameter θ of a Weibull population with known shape parameter K. The estimator is given by

$$\check{\theta}_k = \check{c}_k y_k \tag{8}$$

where $y_k (k = 1, 2, \ldots, n)$ is the kth order statistic of the sample and

$$\check{c}_k = \check{c}_{k,n,K} = 1/\left[n \binom{n-1}{k-1} \Gamma(1 + 1/K) \sum_{j=0}^{k-1} \binom{k-1}{j} (-1)^{k+j-1}/(n-j)^{1+1/K} \right]. \tag{9}$$

Quayle has tabulated $\check{c}_r$, where r is the value of k chosen so as to minimize the variance of $\check{\theta}_k$, for $n = 1(1)20(2)40$, $K = 0.5(0.5)4.0(1.0)8.0$. The estimator given in subsection 1.2.1 above is

$$\tilde{\theta}_k = \tilde{c}_k y_k \tag{10}$$

where

$$\tilde{c}_k = \tilde{c}_{k,n,K} = 1/\left\{ \sum_{j=0}^{k-1} [1/(n-j)] \right\}^{1/K}. \tag{11}$$

Equations (9) and (11) illustrate the advantage of the estimator found here. Since the K appears only outside the summation sign in Equation (11), we need only calculate the sum once for each pair of values of n and k. Both estimators are based on the same order statistic and therefore $\tilde{\theta}_k$ is a biased estimator except for the case in which the Weibull density reduces to the exponential density, that is when $K = 1$, for which the two estimators are identical.

1.2.3. MONTE CARLO STUDY OF RATIOS OF MEAN SQUARE ERRORS

Moore and Harter (1966) conjectured that the ratio of the mean square errors of the maximum-likelihood m-order-statistic estimator and of the one-order-statistic estimator for the scale parameter of a Weibull population with known shape parameter is closely approximated by the relative efficiency of the one-order-statistic estimator of the parameter of a one-parameter exponential population as compared with the m-order-

statistic estimator, which had been tabulated by Moore and Harter (1965, 1966) [see Table D2 of the present volume]. (It should be noted that one may speak of relative efficiencies in the case of the exponential population, since the estimators are unbiased, but only of ratios of mean square errors in the case of the Weibull population, for which the estimators are biased.) In order to check the validity of the conjecture, a Monte Carlo study of the ratios of mean square errors was performed. One thousand random samples each of size $n[n = 1(1)40]$ from a one-parameter exponential population with parameter $\sigma = 1$ were generated in the IBM 7094 computer. These were transformed into samples from a two-parameter Weibull population with scale parameter $\theta = 1$ and shape parameter $K = 2$. From each sample, the one-order-statistic estimate, based on the kth order statistic [$k = \min(m, r)$, where r is chosen so as to minimize the variance of the one-order-statistic estimator of the exponential parameter], and the m-order-statistic estimate, based on the first m order statistics [$m = 1(1)n$], of the exponential parameter σ or the Weibull scale parameter θ were computed. For each population and for each combination of m and n, the ratio of the mean square error of the m-order-statistic estimates to that of the one-order-statistic estimates was calculated. Except for fluctuations due to random sampling, the ratios of the mean square errors in the case of the exponential parameter should agree with the tabulated relative efficiencies, and it was found that the agreement was quite good. Moreover, it was found that the ratios of mean square errors in the case of the Weibull scale parameter agreed with the tabulated relative efficiencies almost as well as did those for the exponential parameter, thus confirming the conjecture.

1.3. INTERVAL ESTIMATION OF THE SCALE PARAMETER θ

Harter (1964) [see Chapter IV, Section 2 of the present volume] has obtained exact upper and lower confidence bounds and central confidence intervals, based on the mth order statistic, x_m, of a sample of size n, for the parameter of a one-parameter exponential population for a wide range of confidence levels. He tabulated [see Table D4 of the present volume] the coefficients B_{um}/x_m and B_{lm}/x_m for $n = 1(1)20(2)40$ and m optimal for a wide range of confidence levels. If we introduce the notation $D_{lm} = B_{lm}/x_m$ and $D_{um} = B_{um}/x_m$, then the exact confidence interval based on one order statistic is given by

$$D_{lm}x_m < \sigma < D_{um}x_m. \tag{12}$$

If the random variable Y has a Weibull distribution with scale parameter θ and shape parameter K, then we have seen in subsection 1.2.1 that the random variable $X = Y^K$ has an exponential distribution with parameter $\sigma = \theta^K$. Hence, if we let $X = Y^K$, Inequality (12) becomes

$$D_{lm}y_m^K < \sigma < D_{um}y_m^K. \tag{13}$$

Taking the Kth root of each member of Inequality (13), we obtain

$$D_{lm}^{1/K}y_m < \sigma^{1/K} < D_{um}^{1/K}y_m. \tag{14}$$

But $\theta = \sigma^{1/K}$, and therefore

$$D_{lm}^{1/K}y_m < \theta < D_{um}^{1/K}y_m \tag{15}$$

gives an exact central confidence interval for the scale parameter θ of a Weibull population with known shape parameter K, the left and right members being respectively exact lower and upper confidence bounds, with confidence levels the same as for the tabulated values D_{lm} and D_{um}.

1.4. USE OF TABLES

In life-testing situations, one may wish to terminate a test without waiting for all items to fail or one may wish to estimate the unknown parameter of the population as the test progresses. If the life distribution is Weibull, and if m out of n items placed on test have failed, one may estimate the scale parameter θ by using Equation (7) with $k = \min(m, r)$, where r is the value of k chosen so as to minimize the variance of the estimator $\tilde{\sigma}_k$, given by Equation (1), of the exponential parameter σ from a complete sample of size n.

For given values of n and m $[n=1(1)40,\ m=1(1)n]$, the values of k and $c_k=c(k,\ n)$ can be read from Table D2, as can the efficiency of the one-order-statistic estimator given by Equation (1) for the exponential parameter relative to the m-order-statistic estimator. To approximate the efficiency of the one-order-statistic estimator relative to the estimator based on the complete sample of size n, one would multiply the tabled efficiency by m/n. The latter estimator could, of course, be used only if testing were continued until all n items had failed. The Monte Carlo study described in subsection 1.2.3 has confirmed the conjecture that the relative efficiencies of the estimators of the exponential parameter are good approximations to the corresponding ratios of mean square errors of the estimators of the Weibull scale parameter.

Table D4 gives coefficients of optimal order statistics in exact upper and lower confidence bounds, based on one order statistic, for the parameter of a one-parameter exponential population. These coefficients may also be used to obtain exact confidence bounds, based on one order statistic, for the scale parameter of a two-parameter Weibull population with known shape parameter.

In the case of both point and interval estimators, the single order statistic which is optimal for estimating the exponential parameter is not necessarily optimal for estimating the Weibull scale parameter, but in practice its departure from optimality is negligible, as can be seen by a comparison of the estimators obtained from Tables D2 and D4 with the optimal estimators for the Weibull scale parameter given by Quayle (1963).

1.5 NUMERICAL EXAMPLE

Consider the following data (failure times in hours) resulting from a simulated life test on forty components:

5	33	55	65	82	102	114	142
10	34	58	65	85	103	116	143
17	36	58	66	90	106	117	151
32	54	61	67	92	107	124	158
32	55	64	68	92	114	139	195

Suppose that the experimenter knows that the above data have come from a two-parameter Weibull population with shape parameter $K=2.0$, and that he wishes to find a point estimate and 80 percent lower and upper confidence bounds for the scale parameter θ. Harter and Moore (1965) [see Chapter V, subsection 1.4 of the present volume] have previously done this for estimates based on the first m order statistics $[m=8(8)40]$. From Tables D2 (or D1) and D4 of the present volume, one finds that, for the parameter of a one-parameter exponential population, the optimal order statistic, from a sample of size forty, for obtaining a point estimator and the 80 percent lower and upper confidence bounds is the thirty-second, with coefficients 0.640744, 0.553447, and 0.768717, respectively. Substituting these coefficients and the value of the 32nd order statistic of the above sample in Equation (7) and Inequality (15), one finds that the point estimate of the scale parameter of the Weibull population from which the above sample came is $[0.640744]^{1/2}\ (116) = 92.9$, the 80 percent lower confidence bound is $[0.553447]^{1/2}\ (116) = 86.3$, and the 80 percent upper confidence bound is $[0.768717]^{1/2}\ (116) = 101.7$. These may be compared with the results 93.7, 87.6, and 101.7 obtained from the first 32 order statistics, 93.3, 87.8, and 100.3 obtained from all 40 observations, and the true population parameter 100.

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2. TYPE I EXTREME-VALUE POPULATION WITH KNOWN SCALE PARAMETER*

2.1. INTRODUCTION

In Chapter V, Section 2, a discussion has been given of point and interval estimators, derived by Harter and Moore (1967), of the location parameter of a Type I extreme-value population with known scale parameter, based on the first m order statistics of a sample of size n from the distribution of smallest values. However, in many practical applications, less efficient estimators, based on one order statistic, may be chosen because of their inherent simplicity. In this section, use is made of the relationship between exponential and Type I extreme-value populations to obtain point and interval estimators, based on one order statistic. This is accomplished by applying a suitable transformation to the corresponding point and interval estimators for the parameter of a one-parameter exponential population as discussed in Chapter IV and tabulated in Tables D2 and D4, respectively. The resulting point estimator is consistent but biased. Results are reported of a Monte Carlo study of the ratio of the mean square errors of estimates based on m order statistics and on one order statistic. The use of Table D2 to compute a consistent estimate for the location parameter of a Type I extreme-value population with known scale parameter and the use of Table D4 to compute exact confidence bounds for the extreme-value location parameter are discussed. A numerical example is given of the computation of both point and interval estimates.

2.2. POINT ESTIMATION OF THE LOCATION PARAMETER u

2.2.1. A BIASED ESTIMATOR BASED ON ONE ORDER STATISTIC

If the random variable X has the one-parameter exponential distribution with parameter σ and cumulative distribution function

$$F(x;\sigma)=1\text{-exp}\ (-x/\sigma), \qquad (x\geq 0;\ \sigma>0) \tag{1}$$

then the random variable $Y=b\ \ln X$ has the Type I extreme-value distribution of smallest values with location parameter $u=b\ \ln\sigma$, scale parameter b, and cumulative distribution function

$$G(y;u,b)=1\text{-exp}\{-\exp[(y-u)/b]\}. \qquad (b>0) \tag{2}$$

A one-order-statistic estimator for the parameter of the exponential population was given by Epstein and Sobel (1953) [see Chapter IV, subsection 1.2.1 of the present volume] as

$$\tilde{\sigma}_k=c_k x_k, \tag{3}$$

where

$$c_k=1/\sum_{i=1}^{k}[1/(n-i+1)] \tag{4}$$

and x_k is the kth order statistic of a sample of size n from the exponential population. Values of c_k have been tabulated [see Tables D1 and D2] by Harter (1961) and by Moore and Harter (1965, 1966). Therefore, an estimator of the parameter u (given b) is obtained as follows:

$$\tilde{u}_k=b\ln\tilde{\sigma}_k=b\ln(c_k x_k)=b\ln c_k+b\ln x_k, \tag{5}$$

and since $y=b\ln x$ we obtain

$$\tilde{u}_k=b\ln c_k+y_k, \tag{6}$$

*An earlier version of this material was published by Moore and Harter (1966).

where c_k is given by Equation (4) above and y_k is the kth order statistic of a sample of size n from the extreme-value population. Now $\tilde{u}_k$ is a consistent estimator of the location parameter u of the extreme-value population, since $u = b \ln \sigma$ and $\tilde{\sigma}_k$ is a consistent estimator for the parameter σ of the exponential population.

2.2.2. MONTE CARLO STUDY OF RATIOS OF MEAN SQUARE ERRORS

Moore and Harter (1966) made the same conjecture concerning the ratio of mean square errors of the maximum-likelihood m-order-statistic estimator and of the one-order-statistic estimator in the case of the location parameter of a Type I extreme-value distribution of smallest values as in the case of the scale parameter of a Weibull population with known shape parameter, which was discussed in subsection 1.2.3. The 1000 Monte Carlo samples considered there were further transformed into samples from a Type I extreme-value population with location parameter $b = 1/2$ and scale parameter $\theta = 1$. From each sample, the one-order-statistic estimate, based on the kth order statistic, [$k = \min(m, r)$, where r is chosen so as to minimize the variance of the one-order-statistic estimator of the exponential parameter], and the m-order-statistic estimate, based on the first m order statistics [$m = 1(1)n$], of the extreme-value location parameter u were computed. For each combination of m and n, the ratio of the mean square error of the m-order-statistic estimates to that of the one-order-statistic estimates was calculated. As in the case of the Weibull scale parameter, it was found that the ratios of mean square errors for the estimates agreed with the tabulated relative efficiencies for estimators of the exponential parameter almost as well as did those for estimates of the exponential parameter itself, thus confirming the conjecture.

2.3. INTERVAL ESTIMATION OF THE LOCATION PARAMETER u

Harter (1964) has obtained [see Chapter IV, Section 2 of the present volume] exact upper and lower confidence bounds and central confidence intervals, based on the mth order statistic, x_m, of a sample of size n, for the parameter of a one-parameter exponential population. He tabulated [see Table D4 of the present volume] the coefficients B_{um}/x_m and B_{lm}/x_m for $n = 1(1)20(2)40$ and m optimal for a wide range of confidence levels. If we use the notation $D_{lm} = B_{lm}/x_m$ and $D_{um} = B_{um}/x_m$ introduced in subsection 1.3, then the exact confidence interval based on one order statistic is given by

$$D_{lm} x_m < \sigma < D_{um} x_m. \tag{7}$$

If we let $y = b \ln x$, so that $x = \exp(y/b)$, we obtain

$$D_{lm} \exp(y_m/b) < \sigma < D_{um} \exp(y_m/b), \tag{8}$$

where y_m is the mth order statistic of a sample of size n from the Type I extreme-value distribution of smallest values. Now if we take the natural logarithm of each member of Inequality (8) and multiply by b, we obtain

$$b \ln D_{lm} + y_m < b \ln \sigma < b \ln D_{um} + y_m. \tag{9}$$

But $u = b \ln \sigma$ and therefore by substitution we find that

$$b \ln D_{lm} + y_m < u < b \ln D_{um} + y_m, \tag{10}$$

which gives an exact confidence interval for u, the left and right members being respectively exact lower and upper confidence bounds with the same levels of confidence as for the tabulated values D_{lm} and D_{um}. Hence we have a simple method of computing exact central confidence intervals or upper and lower confidence bounds, based on one order statistic, for the location parameter of the Type I extreme-value distribution of smallest values, with known scale parameter b.

2.4. USE OF TABLES

Tables D2 and D4, respectively, can be used in computing point and interval estimates, based on one order statistic, for the location parameter of a Type I extreme-value population with known scale parameter in much the same way as we have outlined in subsection 1.4 for the scale parameter of a Weibull population

with known shape parameter. Suppose only the first m order statistics of a sample of size n are known, as is the case at the time of the mth failure in a life test of n items, known or assumed to have come from a Type I extreme-value distribution of smallest values with known scale parameter. One can find a point estimate of the location parameter u by using Equation (6) with $k = \min(m,r)$, where r is the value of k chosen so as to minimize the variance of the estimator $\tilde{\sigma}_k$ of the exponential parameter from a complete sample of size n. Again the coefficient $c_k = c(k,n)$ can be read from Table D2, as can the efficiency of the one-order-statistic estimator for the exponential parameter relative to the m-order-statistic estimator, which can be used to approximate the corresponding ratio of mean square errors for the estimators of the extreme-value location parameter. Table D4 can be used, in conjunction with Inequality (10), to calculate interval estimates of the extreme-value location parameter.

The optimal order statistics for obtaining point and interval estimators for the extreme-value location parameter, unlike those for Weibull scale parameter, have not been determined, but there is reason to believe that the departure from optimality is negligible if one uses the values from Tables D2 and D4 based on the exponential population.

2.5. NUMERICAL EXAMPLE

Consider the following data (obtained by taking natural logarithms of the data in the example of subsection 1.5) from a Type I extreme-value population with scale parameter $b = 0.5$:

1.609	3.497	4.007	4.174	4.407	4.625	4.736	4.956
2.303	3.526	4.060	4.174	4.443	4.635	4.754	4.963
2.833	3.584	4.060	4.190	4.500	4.663	4.762	5.017
3.466	3.989	4.111	4.205	4.522	4.673	4.820	5.063
3.466	4.007	4.159	4.220	4.522	4.736	4.934	5.273

Using the same tabular values as in the example of subsection 1.5, one finds by substitution in Equation (6) and Inequality (10) that the point estimate of the location parameter of the extreme-value population is $0.5 \ln 0.640744 + 4.754 = 4.531$, the 80 percent lower confidence bound is $0.5 \ln 0.553447 + 4.754 = 4.458$, and the 80 percent upper confidence bound is $0.5 \ln 0.768717 + 4.754 = 4.623$. These may be compared with the following results of Harter and Moore (1967) [see Chapter V, subsection 2.4 of the present volume]: 4.541, 4.474, and 4.624 (based on the first 32 order statistics); 4.537, 4.476, and 4.610 (based on all 40 observations); and with the true population parameter 4.605 ($= \ln 100$). The confidence bounds are exactly (except for rounding errors) and the point estimates approximately equal to the natural logarithms of the corresponding values obtained in the example of subsection 1.5.

2.6. REFERENCES

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3. TYPE II EXTREME-VALUE POPULATIONS WITH KNOWN SHAPE PARAMETERS *

3.1. INTRODUCTION

In Chapter V, Section 3, a discussion has been given of point and interval estimators, derived by Harter and Moore (1968), of the scale parameters of Type II extreme-value populations with known shape parameter. These estimators are based on the first (last) m order statistics of samples of size n from Type II asymptotic distributions of smallest (largest) values. However, less efficient estimators, based on one order statistic, may be chosen because of their inherent simplicity, or, in the case of the distribution of largest values, because the data required to compute the estimates become available sooner. In this section, use is made of the relationship between exponential and Type II extreme-value populations to obtain such estimators. This is accomplished by applying a suitable transformation to the corresponding estimators for the exponential parameter as discussed in Chapter IV and tabulated in Tables D2 and D4. The resulting point estimators are consistent but biased. A discussion is given of the relative merits of point estimators based on one and on m order statistics. A numerical example is given of the computation of both point and interval estimates.

3.2. POINT ESTIMATION OF THE SCALE PARAMETERS v_1 AND v_n

3.2.1. BIASED ESTIMATORS BASED ON ONE ORDER STATISTIC

If the random variable X has the one-parameter exponential distribution with parameter σ and cumulative distribution function

$$F(x;\sigma) = 1 - \exp(-x/\sigma), \quad (x \geq 0, \sigma > 0) \tag{1}$$

then the random variable $Y = -X^{-1/K}$ has the Type II asymptotic distribution of smallest values with location parameter zero, scale parameter $v_1 = -\sigma^{-1/K}$, shape parameter K, and cumulative distribution function

$$G(y; v_1, K) = 1 - \exp\left[-(y/v_1)^{-K}\right], \quad (y, v_1 < 0; K > 0) \tag{2}$$

A one-order-statistic estimator for the parameter of the exponential population was given by Epstein and Sobel (1953), with coefficients tabulated by Harter (1961) [see Chapter IV, subsection 1.2.1 of the present volume] as

$$\tilde{\sigma}_k = c_k x_k, \tag{3}$$

where

$$c_k = 1/\sum_{i=1}^{k} \left[1/(n-i+1)\right] \tag{4}$$

and x_k is the kth order statistic of a sample of size n from the exponential population. Therefore, a one-order-statistic estimator for the parameter v_1 (given K) is obtained as follows:

$$\tilde{v}_1 \mid K = \tilde{\sigma}_k^{-1/K} = -c_k^{-1/K} x^{-1/K} = c_k^{-1/K} y_k, \tag{5}$$

where c_k is given by Equation (4) above and tabulated in Table D2 and y_k is the kth order statistic of a sample of size n from the Type II asymptotic distribution of smallest values. Now $\tilde{v}_1 \mid K$ is a consistent estimator of the scale parameter v_1 of the Type II asymptotic distribution of smallest values, since $v_1 = -\sigma^{-1/K}$ and $\tilde{\sigma}_k$ is a consistent estimator for the parameter σ of the exponential population.

If we have a Type II asymptotic distribution of smallest values with known location parameter not equal to zero and known shape parameter, then we can transform the original sample data to data with location parameter zero and proceed with the estimation as outlined above.

* An earlier version of this material was published by Moore and Harter (1967).

If we have a sample from a Type II asymptotic distribution of largest values, we can use the symmetry with the distribution of smallest values to obtain an estimator of the scale parameter v_n given the shape parameter K as follows:

$$\tilde{v}_n \mid K = -\tilde{v}_1 \mid K = -c_k^{-1/K} y_k. \tag{6}$$

But $y_k = -z_{n-k+1}$ and therefore we obtain

$$\tilde{v}_n \mid K = c_k^{-1/K} z_{n-k+1}, \tag{7}$$

where c_k is given by Equation (4) and tabulated in Table D2 and z_{n-k+1} is the $(n-k+1)$st order statistic (kth largest value) of a sample of size n from the Type II asymptotic distribution of largest values with location parameter zero, scale parameter $v_n = \sigma^{-1/K}$, shape parameter K, and cumulative distribution function

$$H(z;\, v_n, K) = \exp\,[-(z/v_n)^{-K}],\ (z,\, v_n,\, K > 0). \tag{8}$$

3.2.2. RELATIVE MERITS OF ESTIMATORS BASED ON ONE AND m ORDER STATISTICS

Moore and Harter (1965, 1966) have tabulated [see Table D2 of the present volume] the efficiency of the one-order-statistic estimator of the exponential parameter relative to the m-order-statistic estimator. It was verified by Monte Carlo methods [see subsections 1.2.3 and 2.2.2 of this chapter] that the ratios of the mean square errors of the m-order-statistic estimates and the one-order-statistic estimates, from 1000 samples, for both the scale parameter of a two-parameter Weibull population with known shape parameter and the location parameter of a Type I asymptotic distribution of smallest values with known scale parameter were in close agreement with these efficiencies. A comparison of the mean square errors of estimates computed from the m-order-statistic estimators [see Chapter V, subsection 3.2.1 of the present volume] derived by Harter and Moore (1968) and the one-order-statistic estimators derived in this section should show the same agreement.

3.3. INTERVAL ESTIMATION OF SCALE PARAMETERS v_1 AND v_n

We have seen in subsection 3.2.1 that if the random variable X has the one-parameter negative exponential distribution with parameter σ, then the random variable $Y = -X^{-1/K}$ has the Type II asymptotic distribution of smallest values with location parameter zero, scale parameter $v_1 = -\sigma^{-1/K}$, and shape parameter K. In Chapter IV, Section 2 we have given exact upper and lower confidence bounds and central confidence intervals, obtained by Harter (1964), for the parameter σ of a one-parameter exponential population, based on the mth order statistic x_m. An exact confidence interval is given by

$$D_{lm} x_m < \sigma < D_{um} x_m, \tag{9}$$

where the coefficients $D_{lm} = B_{lm}/x_m$ and $D_{um} = B_{um}/x_m$ have been tabulated [see Table D4] for a wide range of confidence levels, with $n = 1(1)20(2)40$, and m optimal. If we substitute $(-y)^{-K}$ for x in Inequality (9), we obtain

$$D_{lm}(-y_m)^{-K} < \sigma < D_{um}(-y_m)^{-K}, \tag{10}$$

where y_m is the mth order statistic of a sample of size n from the Type II asymptotic distribution of smallest values. Now if we take the Kth root of each member of Inequality (10), multiply each member by minus one, and invert each member, we find

$$D_{lm}^{1/K} y_m < -\sigma^{-1/K} < D_{um}^{1/K} y_m. \tag{11}$$

But $v_1 = -\sigma^{-1/K}$, and therefore we obtain

$$D_{lm}^{1/K} y_m < v_1 < D_{um}^{1/K} y_m, \tag{12}$$

an exact confidence interval for v_1, the left and right members being respectively exact lower and upper confidence bounds with the same level of confidence as for the tabulated values of D_{lm} and D_{um}.

If we have a sample of size n from a Type II asymptotic distribution of largest values, we can again use the symmetry with the distribution of smallest values to obtain the confidence interval for the scale parameter v_n as follows:

$$D_{lm}^{-1/k} z_{n-m+1} > v_n > D_{um}^{-1/k} z_{n-m+1}, \tag{13}$$

where z_{n-m+1} is the $(n-m+1)$st order statistic (mth largest value) from the sample of size n, and the left and right members are respectively exact upper and lower confidence bounds with the same levels of confidence as for the tabulated values D_{lm} and D_{um}.

3.4. NUMERICAL EXAMPLE

The following ordered pseudo-random sample of size 40 was drawn from a Type II asymptotic distribution of largest values with location parameter $\epsilon = 0$ [omitted from Equation (8)], scale parameter (characteristic value) $v_n = 1$, and shape parameter $K = 2$:

0.4409	0.6592	0.7695	0.8960	1.0203	1.2639	1.8244	2.6122
0.4669	0.6730	0.7815	0.9031	1.1049	1.3515	1.8397	4.7915
0.5468	0.6872	0.8199	0.9209	1.1320	1.5679	1.9473	5.1470
0.6099	0.7037	0.8648	0.9566	1.1377	1.7585	2.2080	5.4795
0.6332	0.7452	0.8913	0.9676	1.1406	1.8116	2.3687	6.1992

If we assume that the value of K is known and that ϵ is known to be zero, a consistent point estimator of v_n is given by Equation (7). For $n = 40$, the estimator based on the 9th order statistic (the 32nd largest value in the sample) is optimal or nearly so in the class of one-order-statistic estimators. For the above sample, the estimate of v_n based on the 9th order statistic is $\tilde{v}_n | K = (0.640774)^{-1/2}(0.7037) = 0.8792$, which may be compared with $\hat{v}_n | K = 0.8831$, the maximum-likelihood m-order-statistic estimate based on the 32 highest sample values, again under the assumption that ϵ is known to be zero. Exact confidence bounds, based on one order statistic, for v_n can be found from Inequality (13). The exact upper and lower 80 percent confidence bounds for v_n based on the 9th order statistic of the above sample are $(0.553447)^{-1/2}(0.7037) = 0.9460$ and $(0.768717)^{-1/2}(0.7037) = 0.8027$, while the corresponding bounds based on the 32 highest sample values, as given by Moore and Harter (1968), are 0.9449 and 0.8137 [see Chapter V, subsection 3.4 of the present volume, where *point and interval estimates* based on the last $m = 8(8)40$ order statistics of the above sample are worked out.]

3.5. REMARKS ON APPLICATIONS

The random variable Z having a Type II asymptotic distribution of largest values is subject to the restriction $z \geq \epsilon$, where $\epsilon \geq 0$. This distribution is likely to find application in life testing problems. Estimation based on one order statistic has the advantage that only a small proportion (approximately 20 percent plus one) of the items placed on test need to be tested to failure in order to obtain nearly optimal point and interval estimates of the parameter v_n when ϵ and K are known. By contrast, the m-order-statistic estimates discussed in Chapter V, Section 3 cannot be computed until all of the sample items have failed, since they are based on the last (highest) m order statistics.

Since the Type II asymptotic distribution of smallest values is restricted to negative values, it is difficult to conceive of applications in life testing or reliability. One possible application has been suggested in Chapter V, subsection 3.5.

3.6. REFERENCES

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4. LIMITED AND PARETO POPULATIONS WITH KNOWN LOCATION PARAMETERS*

4.1. INTRODUCTION

In Chapter V, Section 4, a discussion has been given of point and interval estimators, derived by Moore and Harter (1969), of the shape parameters of limited and Pareto populations with known location parameters, based on the first m order statistics of a sample of size n. However, less efficient estimators, based on one order statistic, may be chosen because of their inherent simplicity. In this section, use is made of the relationship between the exponential and the limited and Pareto populations to obtain such estimators. This is accomplished by applying suitable transformations to the corresponding estimators for the exponential parameter as discussed in Chapter IV and tabulated in Tables D2 and D4. The resulting point estimators are consistent but biased. A discussion is given of the relative merits of point estimators based on one and on m order statistics. Numerical examples are given of the computation of both point and interval estimates.

4.2. POINT ESTIMATION OF THE SHAPE PARAMETERS K

4.2.1. BIASED ESTIMATOR OF SHAPE PARAMETER OF LIMITED POPULATION

If the random variable X has the one-parameter exponential distribution with parameter σ and cumulative distribution function

$$F(x;\ \sigma) = 1 - \exp\ (-x/\sigma),\ (x \geq 0, \sigma > 0) \tag{1}$$

then the random variable $Y = \omega - \exp\ (-X)$ has the limited distribution [see Gumbel (1958), p. 157)] with location parameter ω, shape parameter $K = 1/\sigma$, and cumulative distribution function

$$G(y;\ \omega, K) = 1 - (\omega - y)^K. \qquad (\omega - 1 \leq y \leq \omega;\ K > 0) \tag{2}$$

A one-order-statistic estimator for the parameter of the exponential population was given by Epstein and Sobel (1953) [see Chapter IV, subsection 1.2.1 of the present volume] as

$$\tilde{\sigma}_k = c_k x_k, \tag{3}$$

where

$$c_k = 1/\sum_{i=1}^{k} [1/(n-i+1)] \tag{4}$$

and x_k is the kth order statistic of a sample of size n from the exponential population. Therefore a one-order-statistic estimator for the parameter K (given ω) is obtained as follows:

$$\tilde{K}|\omega = 1/\tilde{\sigma}_k = 1/c_k\, x_k = -1/c_k \ln(\omega - y_k), \tag{5}$$

where c_k is given by Equation (4) and tabulated in Table D2 and y_k is the kth order statistic of a sample of size n from the limited distribution. Now $\tilde{K}|\omega$ is a consistent estimator of the shape parameter K of the limited distribution, since $K = 1/\sigma$ and $\tilde{\sigma}_k$ is a consistent estimator for the exponential parameter σ.

4.2.2. BIASED ESTIMATOR OF SHAPE PARAMETER OF PARETO POPULATION

If the random variable X has the one-parameter exponential distribution with parameter σ and cumulative distribution function given by Equation (1), then the random variable $Z = \epsilon + \exp X$ has the Pareto distribution [see Gumbel (1958, p. 157)] with location parameter ϵ, shape parameter $K = 1/\sigma$, and cumulative distribution function

$$H(z;\ \epsilon, K) = 1 - (z - \epsilon)^{-K}. \qquad (z \geq 1 + \epsilon, K > 0) \tag{6}$$

*An earlier version of this material was published by Moore and Harter (1967).

Therefore a one-order-statistic estimator of K (given ϵ) is obtained as follows:

$$\tilde{K}|\epsilon = 1/\tilde{\sigma}_k = 1/c_k x_k = 1/c_k \ln (z_k - \epsilon), \tag{7}$$

where c_k is given by Equation (4) and tabulated in Table D2 and z_k is the kth order statistic of a sample of size n from the Pareto distribution. Now $\tilde{K}|\epsilon$ is a consistent estimator of the shape parameter K of the Pareto distribution, since $K = 1/\sigma$ and $\tilde{\sigma}_k$ is a consistent estimator of the exponential parameter σ.

4.2.3. RELATIVE MERITS OF ESTIMATORS BASED ON ONE AND m ORDER STATISTICS

Moore and Harter (1965, 1966) have tabulated [see Table D2 of the present volume] the efficiency of the one-order-statistic estimator of the exponential parameter relative to the m-order-statistic estimator. It was verified by Monte Carlo methods [see subsections 1.2.3 and 2.2.2 of this chapter] that the ratios of the mean square errors of the m-order-statistic estimates and the one-order-statistic estimates, from 1000 samples, for both the scale parameter of a two-parameter Weibull population with known shape parameter and the location parameter of a Type I asymptotic distribution of smallest values with known scale parameter were in close agreement with these efficiencies. A comparison of the mean square errors of the estimates computed from the m-order-statistic estimators [see Chapter V, subsection 3.2.1 of the present volume] derived by Harter and Moore (1968) and the one-order-statistic estimators derived in this section should show the same agreement. As in the case of other one-order-statistic estimators obtained by transforming the optimal estimators for the exponential parameter, there is no guarantee that the estimators obtained here are optimal in the class of one-order-statistic estimators but in practice the departure from optimality is negligible.

4.3. INTERVAL ESTIMATION OF SHAPE PARAMETERS K

4.3.1. EXACT CONFIDENCE BOUNDS FOR SHAPE PARAMETER OF LIMITED POPULATION

We have seen in subsection 4.2.1 that if the random variable X has the one-parameter exponential distribution with parameter σ, then the random variable $Y = \omega - \exp(-X)$ has the limited distribution with location parameter ω and shape parameter $K = 1/\sigma$. In Chapter IV, Section 2 we have given exact upper and lower confidence bounds and central confidence intervals, obtained by Harter (1964), for the parameter σ of a one-parameter exponential population, based on the mth order statistic x_m. An exact confidence interval is given by

$$D_{lm} x_m < \sigma < D_{um} x_m, \tag{8}$$

where the coefficients $D_{lm} = B_{lm}/x_m$ and $D_{um} = B_{um}/x_m$ have been tabulated [see Table D4] for a wide range of confidence levels, with $n = 1(1)20(2)40$ and m optimal. If we set $x = -\ln(\omega - y)$ in Inequality (8), we obtain

$$-D_{lm} \ln (\omega - y_m) < \sigma < -D_{um} \ln (\omega - y_m), \tag{9}$$

where y_m is the mth order statistic of a sample of size n from the limited population. By inverting the members of the inequality, we obtain

$$-1/D_{lm} \ln (\omega - y_m) > 1/\sigma > -1/D_{um} \ln (\omega - y_m). \tag{10}$$

But $K = 1/\sigma$ and therefore

$$-1/D_{lm} \ln (\omega - y_m) > K > -1/D_{um} \ln (\omega - y_m) \tag{11}$$

is an exact confidence interval for K, the left and right members of Inequality (11) being respectively exact upper and lower confidence bounds for K with the same levels of confidence as for the tabulated values D_{lm} and D_{um}.

4.3.2. EXACT CONFIDENCE BOUNDS FOR SHAPE PARAMETER OF PARETO POPULATION

We have seen in subsection 4.2.2 that if the random variable X has the one-parameter exponential distribution with parameter σ, then the random variable $Z = \epsilon + \exp X$ has the Pareto distribution with location

parameter ϵ and shape parameter $K = 1/\sigma$. If, in Inequality (8), we set $x = \ln(z - \epsilon)$, we obtain

$$D_{lm} \ln(z_m - \epsilon) < \sigma < D_{um} \ln(z_m - \epsilon), \tag{12}$$

where z_m is the mth order statistic of a sample of size n from the Pareto population. By inverting the members of the inequality, we obtain

$$1/D_{lm} \ln(z_m - \epsilon) > 1/\sigma > 1/D_{um} \ln(z_m - \epsilon). \tag{13}$$

But $K = 1/\sigma$ and therefore

$$1/D_{lm} \ln(z_m - \epsilon) > K > 1/D_{um} \ln(z_m - \epsilon) \tag{14}$$

is an exact confidence interval for K, the left and right members being respectively exact upper and lower confidence bounds with the same levels of confidence as for the tabulated values D_{lm} and D_{um}.

4.4. NUMERICAL EXAMPLES

Example 1. The following ordered pseudo-random sample of size 40 was drawn from a limited population with parameters $\omega = 1$ and $K = 1$:

0.0006	0.1547	0.2854	0.3935	0.4963	0.6211	0.7703	0.8634
0.0117	0.1645	0.2865	0.3964	0.5535	0.6371	0.8145	0.8821
0.0962	0.1994	0.3212	0.4372	0.5600	0.6807	0.8214	0.9219
0.1029	0.2281	0.3532	0.4526	0.5970	0.6835	0.8480	0.9648
0.1186	0.2390	0.3923	0.4888	0.5995	0.7682	0.8632	0.9970

If we assume that the value of ω is known, a consistent point estimator of K is given by Equation (5), where $c_k = c(k, n)$ has been tabulated [see Tables D1 and D2 of the present volume] by Harter (1961) for complete samples of size $n = 1(1)100$ and by Moore and Harter (1965, 1966) for censored samples (first m order statistics) of size $n = 1(1)40$, $m = 1(1)n$, and k such that x_k is optimal among the available order statistics for estimating the exponential parameter σ by use of Equation (3). The same value of k is optimal or nearly so for the limited and other related populations. For a complete sample of size $n = 40$, one finds $k = 32$ and $c_k = 0.640744$. The resulting one-order-statistic estimate of K, based on the 32nd order statistic, is $\tilde{K} \mid \omega = -1/0.640744 \ln(1 - 0.8145) = 0.9264$, which may be compared with $\hat{K} \mid \omega = 0.9754$, the maximum-likelihood m-order-statistic estimate, given by Moore and Harter (1969) [see Chapter V, subsection 4.4 of the present volume], based on the first 32 order statistics, again under the assumption that ω is known. Exact confidence bounds, based on one order statistic, for K can be found from Inequality (11), with the aid of coefficients read from Table D4, which were tabulated by Harter (1964). The exact upper and lower 80 percent confidence bounds for K, based on the 32nd order statistic of the above sample, are $-1/0.553447 \ln(1 - 0.8145) = 1.0725$ and $-1/0.768717 \ln(1 - 0.8145) = 0.7721$, while the corresponding bounds, given by Moore and Harter (1969) [see Chapter V, subsection 4.4 of the present volume], based on the first 32 order statistics, are 1.1168 and 0.8281.

The random variable Y having the limited distribution is restricted to the interval $\omega - 1 \leq y \leq \omega$. If one takes $\omega = 1$, as in the above example, values of y are restricted to the interval $[0, 1]$. This special case is likely to have applications in reliability problems. If one takes $K = 1$, as in the above example, the distribution is uniform, but the estimation procedure works equally well for more general true values of the parameter K.

Example 2. The following pseudo-random sample of size 40 was drawn from a Pareto distribution with parameters $\epsilon = 0$ and $K = 1$:

1.0518	1.2526	1.3995	1.6715	2.3107	3.3146	4.7971	10.9258
1.0534	1.3604	1.4715	1.9564	2.3611	3.7712	5.1568	11.1492
1.1158	1.3662	1.4767	2.0622	2.4993	3.9670	5.1841	14.7554
1.1382	1.3786	1.4889	2.1212	2.6975	4.1188	7.1695	15.9696
1.1859	1.3932	1.5929	2.2638	2.8309	4.4773	8.0258	17.8400

If we assume that the value of ϵ is known, a consistent point estimator of K is given by Equation (7). The resulting one-order-statistic estimate of K, based on the 32nd order statistic, is $\tilde{K} \mid \epsilon = 1/0.640744 \ln 5.1568 = 0.9515$, which may be compared with $\hat{K} \mid \epsilon = 0.9076$, the maximum-likelihood m-order-statistic estimate

based on the first 32 order statistics, again under the assumption that ϵ is known. Exact confidence bounds, based on one order statistic, for K can be found from Inequality (14). The upper and lower 80 percent confidence bounds for K based on the 32nd order statistic of the above sample are $1/0.553447 \ln 5.1568 = 1.1015$ and $1/0.768717 \ln 5.1568 = 0.7931$, while the corresponding bounds based on the first 32 order statistics were found by Moore and Harter (1969) [see Chapter V, subsection 4.4 of the present volume] to be 1.1168 and 0.8281.

The random variable Z having the Pareto distribution is subject to the restriction $z \geq 1 + \epsilon$, with the added restriction $\epsilon \geq 0$, though mathematically unnecessary, often imposed in practice. This distribution is likely to find application in life testing with positive guaranteed life.

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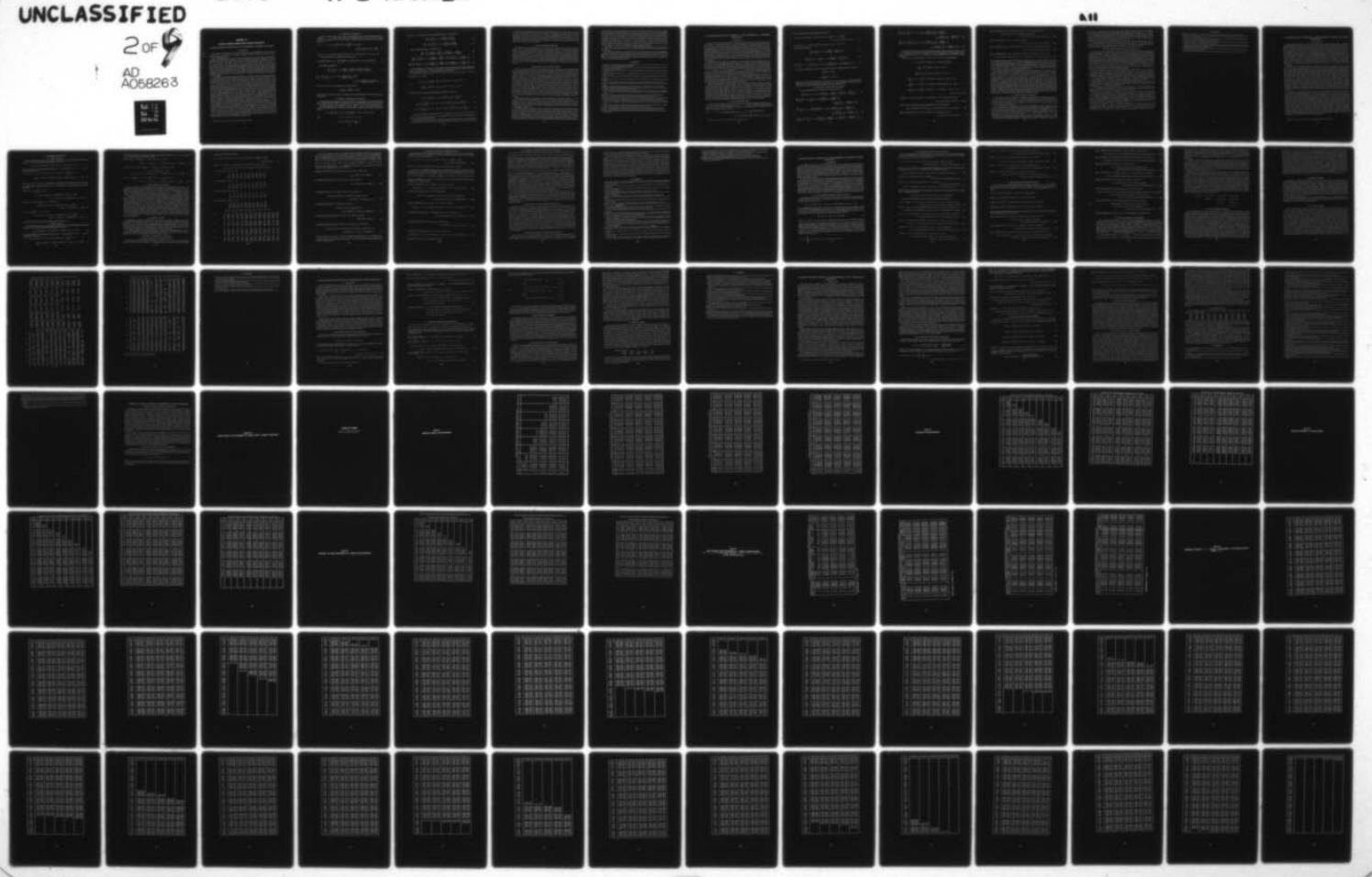

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CHAPTER VII

DOUBLY CENSORED SAMPLES FROM VARIOUS POPULATIONS

1. MAXIMUM-LIKELIHOOD ESTIMATION OF TWO PARAMETERS OF NORMAL POPULATION*

1.1. INTRODUCTION

The estimation of the parameters of a censored sample from a normal population has been considered by many authors, who have used several different methods including the method of least squares and the method of maximum likelihood.

Lloyd (1952) applied the theory of least squares estimation to an ordered sample from distributions depending on location and scale parameters only. Gupta (1952) derived best linear estimators ($n \leq 10$) for the mean and variance using singly censored samples from normal populations and for larger values of n derived an alternative linear estimator. Sarhan and Greenberg (1956, 1958a, 1958b) estimated the mean and standard deviation of normal populations from singly and doubly censored samples ($n \leq 20$) by the method of least squares. Saw (1959) developed simplified unbiased estimators of the mean and variance given a singly censored sample from a normal population ($n \leq 20$). Dixon (1957, 1960) derived simplified estimators of the mean and standard deviation for complete and censored normal samples which are almost as efficient as the best linear estimators ($n \leq 20$). Walsh (1956) obtained distribution-free estimators for the population mean and variance for a rather general class of continuous statistical populations using doubly censored samples.

Cohen (1950) used the method of maximum likelihood to estimate the parameters of normal populations from singly and doubly truncated samples. The term "truncated samples" was used by Cohen in a sense somewhat broader than its present usage and included what are now called "censored samples." Cohen was primarily concerned, however, with Type I censoring (at a specified time) rather than Type II censoring (when a specified number of failures have occurred). Gupta (1952) found maximum likelihood equations for estimators of the parameters of a normal population from a sample censored from above (Type II censoring), and determined their asymptotic variances and covariances. Halperin (1952) proved under mild regularity conditions that the maximum-likelihood estimator of a single parameter from singly censored samples is consistent, asymptotically normally distributed, and of minimum variance for large samples and indicated his results could be generalized to several parameters and more general censoring. Breakwell (1953) also obtained maximum-likelihood estimators for singly censored samples, asymptotic distributions of the estimators, and their asymptotic biases. Plackett (1958) showed that maximum-likelihood estimators are asymptotically linear and that the best linear unbiased estimators are asymptotically normal and efficient. Plackett computed a "linearized maximum-likelihood" estimator and compared it with the best linear unbiased estimator for the standard deviation of a normal population from censored samples ($n \leq 10$). In three later papers Cohen (1955, 1959, 1961) extended the results given in his 1950 paper. The present section in part duplicates the work of Cohen and Gupta but extends the results for Type II censoring to include maximum-likelihood estimation of the parameters of a normal population from a doubly censored sample, together with a completely computerized iterative procedure, and mathematical expressions and tables for asymptotic variances and covariances. The mathematical formulation for maximum-likelihood estimation is given in subsection 1.2; the asymptotic variances and covariances of the estimators are given in subsection 1.3. A discussion of the iterative procedure for maximum-likelihood estimation is given in subsection 1.4. A Monte Carlo study of the maximum-likelihood estimators together with a comparison with the best linear unbiased estimator is given, for small samples, in subsection 1.5.

*An earlier version of this material was published by Harter and Moore (1966).

1.2. MATHEMATICAL FORMULATION

Consider a random sample of size n from a normal population with mean μ and standard deviation σ and let $X_{r_1+1}, \ldots, X_{n-r_2}$ be the ordered observations remaining when the r_1 smallest observations and the r_2 largest observations have been censored. The joint probability density function of these order statistics is given by:

$$f(x_{r_1+1}, \ldots, x_{n-r_2}; \mu, \sigma) = \frac{n!}{r_1! r_2!} \{\sigma\sqrt{2\pi}\}^{-m} \exp \sum_{i=r_1+1}^{n-r_2} \{-(x_i-\mu)^2/2\sigma^2\} \cdot \left[F\left(\frac{x_{r_1+1}-\mu}{\sigma}\right)\right]^{r_1} \left[1-F\left(\frac{x_{n-r_2}-\mu}{\sigma}\right)\right]^{r_2}, \quad (1)$$

where $m = n-(r_1+r_2)$ and $F(z_i) = \int_{-\infty}^{z_i} f(t)dt$, with $z_i = (x_i-\mu)/\sigma$ and $f(z_i) = (2\pi)^{-1/2} \exp(-z_i^2/2)$.

The natural logarithm of the likelihood function is given by

$$L = \ln \frac{n!}{r_1! r_2!} - \frac{m}{2} \ln 2\pi - m \ln \sigma - \sum_{i=r_1+1}^{n-r_2} \frac{(x_i-\mu)^2}{2\sigma^2} + r_1 \ln F\left(\frac{x_{r_1+1}-\mu}{\sigma}\right) + r_2 \ln\left[1-F\left(\frac{x_{n-r_2}-\mu}{\sigma}\right)\right]. \quad (2)$$

The likelihood equations are:

$$\frac{\partial L}{\partial \mu} = \frac{1}{\sigma^2} \sum_{i=r_1+1}^{n-r_2} (x_i-\mu) - \frac{r_1 f[(x_{r_1+1}-\mu)/\sigma]}{\sigma F[(x_{r_1+1}-\mu)/\sigma]} + \frac{r_2}{\sigma} \frac{f[(x_{n-r_2}-\mu)/\sigma]}{1-F[(x_{n-r_2}-\mu)/\sigma]} = 0, \quad (3)$$

$$\frac{\partial L}{\partial \sigma} = -\frac{m}{\sigma} + \frac{1}{\sigma^3} \sum_{i=r_1+1}^{n-r_2} (x_i-\mu)^2 - r_1 \frac{[(x_{r_1+1}-\mu)/\sigma^2] f[(x_{r_1+1}-\mu)/\sigma]}{F[(x_{r_1+1}-\mu)/\sigma]} + r_2 \frac{[(x_{n-r_2}-\mu)/\sigma^2] f[(x_{n-r_2}-\mu)/\sigma]}{1-F[(x_{n-r_2}-\mu)/\sigma]} = 0. \quad (4)$$

If $m = n$, i.e. if $r_1 = r_2 = 0$, these equations have explicit solutions

$$\hat{\mu} = \sum_{i=1}^{n} x_i/n, \hat{\sigma} = \left\{\sum_{i=1}^{n} (x_i-\hat{\mu})^2/n\right\}^{1/2}$$

The details of the iterative procedure for determining the maximum-likelihood estimates will be given in subsection 1.4.

1.3. ASYMPTOTIC VARIANCES AND COVARIANCES

Gupta (1952) has given theoretical expressions and a table for the asymptotic variances and covariances of the maximum-likelihood estimators of the parameters of a normal population from singly censored (from above) samples. His results will be extended in this subsection to the case of doubly censored samples.

The natural logarithm of the likelihood function of a sample of size n, from a normal population with mean μ and standard deviation σ, the lowest r_1 and the highest r_2 sample values having been censored, is given by

$$L = \ln \frac{n!}{r_1! r_2!} - \frac{m}{2} \ln 2\pi - m \ln \sigma - \sum_{i=r_1+1}^{n-r_2} \frac{(x_i-\mu)^2}{2\sigma^2} + r_1 \ln F(z_1) + r_2 \ln [1-F(z_2)], \quad (5)$$

where $z_1 = (x_{r_1+1}-\mu)/\sigma$, $z_2 = (x_{n-r_2}-\mu)/\sigma$,

$$F(z_i) = \int_{-\infty}^{z_i} f(t)dt, f(z_i) = \frac{1}{\sqrt{2\pi}} e^{-z_i^2/2}.$$

and $m=n-r_1-r_2$. In this notation, the first partial derivatives of L are given by

$$\frac{\partial L}{\partial \mu}=\frac{1}{\sigma^2}\sum_{i=r_1+1}^{n-r_2}(x_i-\mu)-\frac{r_1}{\sigma}\frac{f(z_1)}{F(z_1)}+\frac{r_2}{\sigma}\frac{f(z_2)}{1-F(z_2)}, \tag{6}$$

$$\frac{\partial L}{\partial \sigma}=-\frac{m}{\sigma}+\frac{1}{\sigma^3}\sum_{i=r_1+1}^{n-r_2}(x_i-\mu)^2-\frac{r_1}{\sigma}\frac{z_1 f(z_1)}{F(z_1)}+\frac{r_2}{\sigma}\frac{z_2 F(z_2)}{1-F(z_2)}. \tag{7}$$

The second partial derivatives of L are given by

$$\frac{\partial^2 L}{\partial \mu^2}=-\frac{m}{\sigma^2}-\frac{r_1}{\sigma^2}\frac{f(z_1)}{F(z_1)}\left[z_1+\frac{f(z_1)}{F(z_1)}\right]+\frac{r_2}{\sigma^2}\frac{f(z_2)}{1-F(z_2)}\left[z_2-\frac{f(z_2)}{1-F(z_2)}\right], \tag{8}$$

$$\frac{\partial^2 L}{\partial \mu \partial \sigma}=-\frac{2}{\sigma^3}\sum_{i=r_1+1}^{n-r_2}(x_i-\mu)-\frac{r_1}{\sigma^2}\frac{f(z_1)}{F(z_1)}\left[z_1^2+z_1\frac{f(z_1)}{F(z_1)}-1\right]+\frac{r_2}{\sigma^2}\frac{f(z_2)}{1-F(z_2)}\left[z_2^2-z_2\frac{f(z_2)}{1-F(z_2)}-1\right], \tag{9}$$

$$\frac{\partial^2 L}{\partial \sigma^2}=\frac{m}{\sigma^2}-\frac{3}{\sigma^4}\sum_{i=r_1+1}^{n-r_2}(x_i-\mu)^2-\frac{r_1}{\sigma^2}\frac{z_1 f(z_1)}{1-F(z_1)}\left[z_1^2+z_1\frac{f(z_1)}{F(z_1)}-2\right]+\frac{r_2}{\sigma^2}\frac{z_2 f(z_2)}{1-F(z_2)}\left[z_2^2-z_2\frac{f(z_2)}{1-F(z_2)}-2\right]. \tag{10}$$

In what follows here and in Sections 5 and 6 of this chapter, mathematical rigor would require that the symbol "$\rightarrow$" be replaced by "converges in probability to", that the expectations be made conditional on z_1 and z_2, and that the limits as $n\rightarrow\infty$ be replaced by limits in probability.

Now let $q_1=r_1/n$, $q_2=r_2/n$, and $p=1-q_1-q_2=m/n$. As $n\rightarrow\infty$ (q_1 and q_2 fixed), $z_1\rightarrow\hat{z}_1$ where $\int_{-\infty}^{\hat{z}_1}f(t)dt=q_1$, $z_2\rightarrow\hat{z}_2$ where

$$\int_{\hat{z}_2}^{\infty}f(t)dt=q_2,\ E\left(\sum_{i=r_1+1}^{n-r_2}\frac{x_i-\mu}{\sigma}\right)\rightarrow n\int_{\hat{z}_1}^{\hat{z}_2}tf(t)dt=-n[f(\hat{z}_2)-f(\hat{z}_1)],$$

and

$$E\left(\sum_{i=r_1+1}^{n-r_2}\left(\frac{x_i-\mu}{\sigma}\right)^2\right)\rightarrow n\int_{\hat{z}_1}^{\hat{z}_2}t^2f(t)dt=n[p-\{\hat{z}_2f(\hat{z}_2)-\hat{z}_1f(\hat{z}_1)\}].$$

The elements of the information matrix $\left(\text{multiplied by }\frac{\sigma^2}{n}\right)$ may be written as

$$\lim_{n\rightarrow\infty}-\frac{\sigma^2}{n}E\left[\frac{\partial^2 L}{\partial\mu^2}\right]=p+f(\hat{z}_1)\left[\hat{z}_1+\frac{f(\hat{z}_1)}{q_1}\right]-f(\hat{z}_2)\left[\hat{z}_2-\frac{f(\hat{z}_2)}{q_2}\right]=v^{11}, \tag{11}$$

$$\lim_{n\rightarrow\infty}-\frac{\sigma^2}{n}E\left[\frac{\partial^2 L}{\partial\mu\partial\sigma}\right]=f(\hat{z}_1)-f(\hat{z}_2)+\hat{z}_1f(\hat{z}_1)\left[\hat{z}_1+\frac{f(\hat{z}_1)}{q_1}\right]-\hat{z}_2f(\hat{z}_2)\left[\hat{z}_2-\frac{f(\hat{z}_2)}{q_2}\right]=v^{12}, \tag{12}$$

$$\lim_{n\rightarrow\infty}-\frac{\sigma^2}{n}E\left[\frac{\partial^2 L}{\partial\sigma^2}\right]=2p+\hat{z}_1f(\hat{z}_1)-\hat{z}_2f(\hat{z}_2)+\hat{z}_1^2f(\hat{z}_1)\left[z_1+\frac{f(\hat{z}_1)}{q_1}\right]-\hat{z}_2^2f(\hat{z}_2)\left[\hat{z}_2-\frac{f(\hat{z}_2)}{q_2}\right]=v^{22}. \tag{13}$$

The asymptotic variance-covariance matrix for the estimators $\hat{\mu}$ and $\hat{\sigma}$ is then $\frac{\sigma^2}{n}[v_{ij}]$, where $[v_{ij}]=[v^{ij}]^{-1}$. If one drops the terms involving $\hat{z}_2$ from Equations (11)–(13) the results agree with those given by Gupta for the case of single censoring.

The computation of the elements v^{ij} of the information matrix (multiplied by σ^2/n), as given by Equations (11)–(13), and the inversion of this matrix to obtain the coefficients of σ^2/n in the variance-covariance matrix

were performed on the IBM 1620 computer. The resulting coefficients of σ^2/n in Var $(\hat{\mu})$, Cov $(\hat{\mu}, \hat{\sigma})$, Var $(\hat{\sigma})$, Var $(\hat{\mu}|\sigma)$ and Var $(\hat{\sigma}|\mu)$ are given in Table F1 for all combinations of q_1 and q_2 which are integral multiples of 0.1 and which are such that $q_1 + q_2 < 1$ and $q_1 \leq q_2$. Only half of the table is given since interchanging the values for q_1 and q_2 would produce no change in the tabular values except that the Cov $(\hat{\mu}, \hat{\sigma})$ would change sign. Values are given to six decimal places. The results for single censoring from above (first ten lines of Table F1), when rounded to five decimal places, agree with those of Gupta, except for slight discrepancies in the case $q_1 = 0.0$, $q_2 = 0.9$.

1.4. ITERATIVE ESTIMATION PROCEDURE

The likelihood equations [Equations (3) and (4)] have explicit solutions only in the case of complete samples $(m = n)$. For censored samples, however, iterative procedures have been developed for finding the joint maximum-likelihood estimators. These involve estimating the parameters, one at a time, in the cyclic order μ, σ, omitting a parameter if it is assumed to be known. One starts by choosing initial estimate(s) for the unknown parameter(s). At each step, the rule of false position (iterative linear interpolation) is used to determine the value of the parameter then being estimated which satisfies the appropriate likelihood equation, in which the latest estimate (or known value) of the other parameter has been substituted. Iteration continues until the results of successive steps agree to within some assigned tolerance. Experience has shown that the rate of convergence is quite rapid if the initial estimates are reasonable and the amount of censoring is not excessive.

1.5. MONTE CARLO STUDY FOR SMALL SAMPLES

There is no known analytic method of determining the variances and covariances of the joint distribution of the maximum-likelihood estimators $\hat{\mu}$ and $\hat{\sigma}$ from small samples. Furthermore, these estimators, while asymptotically unbiased, are known to be biased for small samples [except $\hat{\mu}$ when censoring is absent or symmetric], though analytic expressions for the bias are known only in the case of estimation from the complete sample $(m = n)$. In order to obtain information about the small-sample properties of these estimators, a Monte Carlo study was performed on the IBM 7094 computer. For $n = 10$ and for $n = 20$, one thousand random samples of n standard normal deviates were generated, and the n deviates in each sample were arranged in order from smallest to largest. The iterative procedure described in subsection 1.4 was used to compute the estimates $\hat{\mu}$ and $\hat{\sigma}$, also $\hat{\mu}|\sigma$ and $\hat{\sigma}|\mu$, from the m order statistics remaining in each sample after proportions q_1 and q_2 had been censored from below and from above, respectively, where q_1 and q_2 were taken at intervals of 0.1, subject to the restrictions $q_1 \leq q_2$ and $m \geq 2$. The means, variances, and covariances of the estimates from 1000 samples of size $n = 10$ are given in Table G1A, and similar results for $n = 20$ are given in Table G1B. There is no loss of generality associated with the restriction $q_1 \leq q_2$, since interchanging q_1 and q_2 would produce no change in the expected tabular values except that of reversing the signs of the mean of $\hat{\mu}$ and the covariance of $\hat{\mu}$ and $\hat{\sigma}$. The rows of Table G1A (and likewise Table G1B) are not statistically independent, since they are based on the same samples (with different proportions censored).

The following tentative conclusions may be drawn from Tables G1A and G1B: (1) When $q_1 < q_2$, the estimates $\hat{\mu}$ and $\hat{\mu}|\sigma$ are negatively biased. [By symmetry, these estimates are positively biased when $q_1 > q_2$ and unbiased when $q_1 = q_2$.] (2) The estimates $\hat{\sigma}$ and $\hat{\sigma}|\mu$ are negatively biased regardless of the relative magnitude of q_1 and q_2. (3) The bias in estimating either parameter is much smaller when the other parameter is known than it is when both parameters are being estimated simultaneously. (4) The bias of $\hat{\sigma}$ (μ unknown) is approximately equal to $-1/m$.

It would be desirable to compare the variances of μ and σ from samples of sizes 10 and 20 with the values which one would obtain by substituting $n = 10$ and $n = 20$ in the asymptotic values given in Table F1, as well as with the variances of the best linear unbiased estimators μ^* and σ^*. Direct comparison of variances of estimators is appropriate, however, only when all the estimators are unbiased. In order to compensate for the bias in the maximum-likelihood estimators, the mean square errors of $\hat{\mu}$, $\hat{\sigma}$, $\hat{\mu}|\sigma$, and $\hat{\sigma}|\mu$ were computed. These were compared with the variances of the best linear unbiased estimators given by Sarhan and Greenberg (1962, Table 10C.2) and with the variances of the maximum-likelihood estimators given by the asymptotic

formula, which were obtained by dividing by n the values given in Table F1. The results are shown in Tables G1C and G1D, from which the following tentative conclusions may be drawn: (1) The precision of the MLE $\hat{\mu}$, when proper allowance is made for bias, closely approximates that predicted by the asymptotic formula for the variance of μ, even for m as small as 2, except in cases of strongly asymmetric censoring. (2) The precision of the MLE $\hat{\sigma}$, when proper allowance is made for bias, closely approximates that predicted by the asymptotic formula for the variance of $\hat{\sigma}$, except when m is quite small and/or censoring is strongly asymmetric. (3) Maximum likelihood estimators tend to have somewhat smaller mean square errors than best linear unbiased estimators. The difference is greatest for estimators of μ in cases of strongly asymmetric censoring and for estimators of σ when m is small and/or censoring is strongly asymmetric.

Approximate corrections for the bias of the maximum-likelihood estimators $\hat{\mu}$, $\hat{\sigma}$, $\hat{\mu}|\sigma$, and $\hat{\sigma}|\mu$ for $n = 10$ and $n = 20$ can be made by use of the means found in the Monte Carlo study and recorded in Tables G1C and G1D.

Isida and Tagami (1959) also conducted a Monte Carlo study of bias and precision in maximum-likelihood estimation of the parameters of normal populations, and reached conclusions quite similar to ours. The main differences between the two studies are that (1) their study was restricted to the case of single censoring, while ours considered both single and double censoring and (2) they studied estimates $\hat{\mu}$, $\hat{\sigma}$, and $\hat{\mu}|\sigma$, but not $\hat{\sigma}|\mu$, while we dealt with all four of these.

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2. LOCAL-MAXIMUM-LIKELIHOOD ESTIMATION OF THREE PARAMETERS OF LOGNORMAL POPULATION*

2.1. INTRODUCTION

In their book on the lognormal distribution, Aitchison and Brown (1957, pp. 37–65) have devoted two entire chapters to estimation problems, one each for the two-parameter and three-parameter distributions. They have given a comprehensive summary of efforts up to that time to estimate the parameters of a lognormal population by the method of maximum likelihood, the method of moments, the method of quantiles, the graphical method, and mixed methods. The problem of estimating the parameters of a two-parameter lognormal population with known lower bound is equivalent to that of estimating the parameters of a normal population, which has been considered by a number of authors. Harter and Moore (1966a) have summarized and extended the contributions of others to the solution of that problem, with particular emphasis on the method of maximum likelihood, and have proposed an iterative procedure for obtaining maximum-likelihood estimates of the parameters from complete, singly censored, and doubly censored samples. [See Section 1 of this chapter.]

Maximum-likelihood estimation of the parameters of a three-parameter lognormal population, for complete samples, has been investigated by Wilson and Worcester (1945), Cohen (1951), Aitchison and Brown (1957, pp. 55–56), and Hill (1963). The latter has explored some unusual features of the likelihood function of the three-parameter lognormal population which had apparently gone unnoticed by earlier investigators. In particular, he has shown that there exist paths along which the likelihood function of any ordered sample $x_1, \ldots, x_n$ tends to ∞ as (τ, μ, σ) approaches $(x_1, -\infty, +\infty)$, where τ is the threshold parameter and μ and σ are the mean and the standard deviation of the parent normal population. This global maximum of the likelihood function leads to the ridiculous maximum-likelihood estimates $\hat{\tau} = x_1$, $\hat{\mu} = -\infty$, and $\hat{\sigma} = +\infty$ regardless of the sample. On the other hand, solution of the likelihood equations leads, in most cases, to local-maximum-likelihood estimates which, while not true maximum-likelihood estimates according to the usual definition, are reasonable estimates and appear to possess most of the desirable properties usually associated with maximum-likelihood estimates. Exceptions may occur in the case of small samples, for which the likelihood function may have no clearly defined local maximum.

Apparently nothing had been published prior to the paper by Harter and Moore (1966b) on the problem of estimation for truncated or censored samples from a three-parameter lognormal population, though Aitchison and Brown (1957, pp. 88–91) had discussed the two-parameter case. The present section will be devoted to local-maximum-likelihood estimation, for the three-parameter case, from singly and doubly censored as well as complete samples. An iterative estimation procedure for use on a high-speed computer will be given. This procedure will, in most cases, converge to a point where the likelihood function has a local maximum. If the sample (after censoring, if any) is small, convergence may be slow or the iterative procedure may take off along the path to infinity mentioned above. Even in the latter case, reasonable estimates can be obtained by a modification of the iterative procedure similar to that used by Harter and Moore (1965) for the three-parameter Gamma and Weibull populations. [See Section 3 of this chapter.]

2.2. THE LIKELIHOOD EQUATIONS

Consider a random sample of size n from a three-parameter lognormal population with parameters μ, σ, and τ (the location or threshold parameter). Let $X_{r+1}, \ldots, X_m$ be the ordered observations remaining after the $n-m$ largest and the r smallest observations have been censored. The joint probability density function of these order statistics is given by

$$f(x_{r+1}, \ldots, x_m; \mu, \sigma, \tau) = \frac{n!}{(n-m)!\,r!} \prod_{i=r+1}^{m} \frac{1}{\sigma\sqrt{2\pi}\,(x_i-\tau)} \exp\left\{-\sum_{i=r+1}^{m} \frac{[\ln(x_i-\tau)-\mu]^2}{2\sigma^2}\right\}$$
$$\cdot \left\{1-F\left[\frac{\ln(x_m-\tau)-\mu}{\sigma}\right]\right\}^{n-m} \left\{F\left[\frac{\ln(x_{r+1}-\tau)-\mu}{\sigma}\right]\right\}^{r}. \quad (1)$$

*An earlier version of this material was published by Harter and Moore (1966b).

The natural logarithm of the likelihood function is given by

$$L=\ln\left[n!/(n-m)!r!\right]-\frac{1}{2}(m-r)\ln 2\pi-(m-r)\ln\sigma-\sum_{i=r+1}^{m}\ln(x_i-\tau)-\frac{1}{2}\sum_{i=r+1}^{m}z_i^2$$
$$+(n-m)\ln\left[1-F(z_m)\right]+r\ln F(z_{r+1}), \qquad (2)$$

where $z_i=[\ln(x_i-\tau)-\mu]/\sigma$, $F(z_i)=\int_{-\infty}^{z_i}f(t)dt$, and $f(z_i)=(2\pi)^{-1/2}\exp(-z_i^2/2)$.
The likelihood equations are

$$\frac{\partial L}{\partial\mu}=\frac{1}{\sigma}\left\{\sum_{i=r+1}^{m}z_i+(n-m)\frac{f(z_m)}{1-F(z_m)}-r\frac{f(z_{r+1})}{F(z_{r+1})}\right\}=0, \qquad (3)$$

$$\frac{\partial L}{\partial\sigma}=\frac{1}{\sigma}\left\{-(m-r)+\sum_{i=r+1}^{m}z_i^2+(n-m)\frac{z_m f(z_m)}{1-F(z_m)}-r\frac{z_{r+1}f(z_{r+1})}{F(z_{r+1})}\right\}=0, \qquad (4)$$

$$\frac{\partial L}{\partial\tau}=\sum_{i=r+1}^{m}(x_i-\tau)^{-1}+\frac{1}{\sigma}\left\{\sum_{i=r+1}^{m}\frac{z_i}{x_i-\tau}+(n-m)\frac{f(z_m)}{(x_m-\tau)[1-F(z_m)]}-r\frac{f(z_{r+1})}{(x_{r+1}-\tau)F(z_{r+1})}\right\}=0. \qquad (5)$$

If $m=n$ and $r=0$, Equations (3) and (4) can be solved for μ and σ as explicit functions of τ, yielding

$$\hat{\mu}=\sum_{i=1}^{n}[\ln(x_i-\tau)]/n,$$

$$\hat{\sigma}=\sqrt{\sum_{i=1}^{n}[\ln(x_i-\tau)-\mu]^2/n}$$

Equation (5) cannot be solved explicitly even if $m=n$ and $r=0$. If censoring occurs, none of the likelihood equations has an explicit solution, and it is necessary to resort to iterative solutions. The details of an iterative procedure for solving the likelihood equations will be given in subsection 2.4.

2.3. ASYMPTOTIC VARIANCES AND COVARIANCES

The second partial derivatives of L with respect to the parameters are

$$\frac{\partial^2 L}{\partial\mu^2}=\frac{1}{\sigma^2}\left\{-(m-r)+(n-m)\frac{F(z_m)}{1-F(z_m)}\left[z_m-\frac{f(z_m)}{1-F(z_m)}\right]-r\frac{f(z_{r+1})}{F(z_{r+1})}\left[z_{r+1}+\frac{f(z_{r+1})}{F(z_{r+1})}\right]\right\}, \qquad (6)$$

$$\frac{\partial^2 L}{\partial\sigma^2}=\frac{1}{\sigma^2}\left\{(m-r)-3\sum_{i=r+1}^{m}z_i^2+(n-m)\frac{z_m f(z_m)}{1-F(z_m)}\left[z_m^2-\frac{z_m f(z_m)}{1-F(z_m)}-2\right]\right.$$
$$\left.-r\frac{z_{r+1}f(z_{r+1})}{F(z_{r+1})}\left[z_{r+1}^2+\frac{z_{r+1}f(z_{r+1})}{F(z_{r+1})}-2\right]\right\}, \qquad (7)$$

$$\frac{\partial^2 L}{\partial\tau^2}=\sum_{i=r+1}^{m}(x_i-\tau)^{-2}+\frac{1}{\sigma^2}\left\{\sum_{i=r+1}^{m}\frac{\sigma z_i-1}{(x_i-\tau)^2}+(n-m)\frac{f(z_m)}{(x_m-\tau)^2[1-F(z_m)]}\left[z_m-\frac{f(z_m)}{1-F(z_m)}+\sigma\right]\right.$$
$$\left.-r\frac{f(z_{r+1})}{(x_{r+1}-\tau)^2F(z_{r+1})}\left[z_{r+1}+\frac{f(z_{r+1})}{F(z_{r+1})}+\sigma\right]\right\}, \qquad (8)$$

$$\frac{\partial^2 L}{\partial\mu\partial\sigma}=\frac{1}{\sigma^2}\left\{-2\sum_{i=r+1}^{m}z_i+(n-m)\frac{f(z_m)}{1-F(z_m)}\left[z_m^2-\frac{z_m f(z_m)}{1-F(z_m)}-1\right]-r\frac{f(z_{r+1})}{F(z_{r+1})}\left[z_{r+1}^2+\frac{z_{r+1}f(z_{r+1})}{F(z_{r+1})}-1\right]\right\}, \qquad (9)$$

$$\frac{\partial^2 L}{\partial\mu\partial\tau}=\frac{1}{\sigma^2}\left\{-\sum_{i=r+1}^{m}(x_i-\tau)^{-1}+(n-m)\frac{f(z_m)}{(x_m-\tau)[1-F(z_m)]}\left[z_m-\frac{f(z_m)}{1-F(z_m)}\right]\right.$$
$$\left.-r\frac{f(z_{r+1})}{(x_{r+1}-\tau)F(z_{r+1})}\left[z_{r+1}+\frac{f(z_{r+1})}{F(z_{r+1})}\right]\right\}, \qquad (10)$$

$$\frac{\partial^2 L}{\partial\sigma\partial\tau}=\frac{1}{\sigma^2}\left\{-2\sum_{i=r+1}^{m}\frac{z_i}{(x_i-\tau)}+(n-m)\frac{f(z_m)}{(x_m-\tau)[1-F(z_m)]}\left[z_m^2-\frac{z_m f(z_m)}{1-F(z_m)}-1\right]\right.$$
$$\left.-r\frac{f(z_{r+1})}{(x_{r+1}-\tau)F(z_{r+1})}\left[z_{r+1}^2+\frac{z_{r+1}f(z_{r+1})}{F(z_{r+1})}-1\right]\right\}. \qquad (11)$$

In what follows here and in Section 4 of this chapter, mathematical rigor would require that the symbol "$\rightarrow$" be replaced by "converges in probability to", that the expectations be made conditional on z_{r+1} and z_m, and that the limits as $n\rightarrow\infty$ be replaced by limits in probability. This is actually done explicitly in Section 3.

Let $q_1=r/n$, $q_2=(n-m)/n$, and $p=1-q_1-q_2=(m-r)/n$. As $n\rightarrow\infty$ (q_1 and q_2 fixed),

$$z_{r+1}\rightarrow\hat{z}_{r+1} \text{ where } \int_{-\infty}^{\hat{z}_{r+1}}f(t)dt=q_1,\ z_m\rightarrow\hat{z}_m \text{ where } \int_{\hat{z}_m}^{\infty}f(t)dt=q_2,$$

$$E\sum_{i=r+1}^{m}z_i\rightarrow\int_{\hat{z}_{r+1}}^{\hat{z}_m}tf(t)dt=-[f(\hat{z}_m)-f(\hat{z}_{r+1})],$$

$$E\sum_{i=r+1}^{m}z_i^2\rightarrow\int_{\hat{z}_{r+1}}^{\hat{z}_m}t^2f(t)dt=p-[\hat{z}_m f(\hat{z}_m)-\hat{z}_{r+1}f(\hat{z}_{r+1})],$$

$$E\sum_{i=r+1}^{m}\{(x_i-\tau)^{-1}\}\rightarrow\int_{\hat{z}_{r+1}}^{\hat{z}_m}e^{-(\mu+\sigma t)}f(t)dt=e^{-\mu+\sigma^2/2}[F(\hat{z}_m+\sigma)-F(\hat{z}_{r+1}+\sigma)],$$

$$E\sum_{i=r+1}^{m}\{(x_i-\tau)^{-2}\}\rightarrow\int_{\hat{z}_{r+1}}^{\hat{z}_m}e^{-2(\mu+\sigma t)}f(t)dt=e^{2(\sigma^2-\mu)}[F(\hat{z}_m+2\sigma)-F(\hat{z}_{r+1}+2\sigma)],$$

$$E\sum_{i=r+1}^{m}\{z_i/(x_i-\tau)\}\rightarrow\int_{\hat{z}_{r+1}}^{\hat{z}_m}e^{-(\mu+\sigma t)}tf(t)dt=-e^{-\mu+\sigma^2/2}\{\sigma[F(\hat{z}_m+\sigma)-F(\hat{z}_{r+1}+\sigma)]$$
$$+f(\hat{z}_m+\sigma)-f(\hat{z}_{r+1}+\sigma)\},$$

$$E\sum_{i=r+1}^{m}\{(\sigma z_i-1)/(x_i-\tau)^2\}\rightarrow\int_{\hat{z}_{r+1}}^{\hat{z}_m}e^{-2(\mu+\sigma t)}(\sigma t-1)f(t)dt=-e^{2(\sigma^2-\mu)}\{(2\sigma^2+1)[F(\hat{z}_m+2\sigma)$$
$$-F(\hat{z}_{r+1}+2\sigma)]+\sigma[f(\hat{z}_m+2\sigma)-f(\hat{z}_{r+1}+2\sigma)]\}.$$

The elements of the information matrix (multiplied by σ^2/n) may be written as

$$\lim_{n\rightarrow\infty}(-\sigma^2/n)E(\partial^2L/\partial\mu^2)=p-f(\hat{z}_m)[\hat{z}_m-f(\hat{z}_m)/q_2]+f(\hat{z}_{r+1})[\hat{z}_{r+1}+f(\hat{z}_{r+1})/q_1]=v^{11}, \qquad (12)$$

$$\lim_{n\rightarrow\infty}(-\sigma^2/n)E(\partial^2L/\partial\sigma^2)=2p-\hat{z}_m f(\hat{z}_m)-\hat{z}_m^2 f(z_m)[\hat{z}_m-f(\hat{z}_m)/q_2]+\hat{z}_{r+1}f(\hat{z}_{r+1})$$
$$+\hat{z}_{r+1}^2 f(\hat{z}_{r+1})[\hat{z}_{r+1}+f(\hat{z}_{r+1})/q_1]=v^{22}, \qquad (13)$$

$$\lim_{n\to\infty}(-\sigma^2/n)E(\partial^2L/\partial\tau^2)=e^{2(\sigma^2-\mu)}\{(\sigma^2+1)[F(\hat{z}_m+2\sigma)-F(\hat{z}_{r+1}+2\sigma)]+\sigma[f(\hat{z}_m+2\sigma)$$
$$-f(\hat{z}_{r+1}+2\sigma)]\}-e^{-2(\mu+z_m\sigma)}f(\hat{z}_m)[\hat{z}_m-f(\hat{z}_m)/q_2+\sigma]$$
$$+e^{-2(\mu+z_{r+1}\sigma)}f(\hat{z}_{r+1})[\hat{z}_{r+1}+f(\hat{z}_{r+1})/q_1+\sigma]=v^{33}, \qquad (14)$$

$$\lim_{n\to\infty}(-\sigma^2/n)E(\partial^2L/\partial\mu\partial\sigma)=-f(\hat{z}_m)-\hat{z}_mf(\hat{z}_m)[\hat{z}_m-f(\hat{z}_m)/q_2]$$
$$+f(\hat{z}_{r+1})+\hat{z}_{r+1}f(\hat{z}_{r+1})[\hat{z}_{r+1}+f(\hat{z}_{r+1})/q_1]=v^{12}, \qquad (15)$$

$$\lim_{n\to\infty}(-\sigma^2/n)E(\partial^2L/\partial\mu\partial\tau)=e^{-\mu+\sigma^2/2}[F(\hat{z}_m+\sigma)-F(\hat{z}_{r+1}+\sigma)]-e^{-(\mu+\hat{z}_m\sigma)}f(\hat{z}_m)[\hat{z}_m-f(\hat{z}_m)/q_2]$$
$$+e^{-(\mu+z_{r+1}\sigma)}f(\hat{z}_{r+1})[\hat{z}_{r+1}+f(\hat{z}_{r+1})/q_1]=v^{13}, \qquad (16)$$

$$\lim_{n\to\infty}(-\sigma^2/n)E(\partial^2L/\partial\sigma\partial\tau)=-2e^{-\mu+\sigma^2/2}\{\sigma[F(\hat{z}_m+\sigma)-F(\hat{z}_{r+1}+\sigma)]+f(\hat{z}_m+\sigma)-f(\hat{z}_{r+1}+\sigma)\}$$
$$-e^{-(\mu+\hat{z}_m\sigma)}f(\hat{z}_m)[\hat{z}_m^2-\hat{z}_mf(\hat{z}_m)/q_2-1]+e^{-(\mu+\hat{z}_{r+1}\sigma)}f(\hat{z}_{r+1})[\hat{z}_{r+1}+\hat{z}_{r+1}f(\hat{z}_{r+1})/q_1-1]=v^{23}. \qquad (17)$$

The asymptotic variance-covariance matrix for the estimators $\hat{\mu}$, $\hat{\sigma}$, and $\hat{\tau}$ is then $(\sigma^2/n)[v_{ij}]$, where $[v_{ij}]=[v^{ij}]^{-1}$. The reader will note that v^{11}, v^{22}, and v^{12} are independent of both μ and σ, while v^{33}, v^{13}, and v^{23} are dependent upon both. The dependence upon μ is only through the factor $e^{-\mu}$ in v^{13} and v^{23} and the factor $e^{-2\mu}$ in v^{33}, while the dependence upon σ is more complicated. It follows that, among the elements of the inverse matrix $[v_{ij}]=[v^{ij}]^{-1}$, v_{11}, v_{22}, and v_{12} are independent of μ, v_{13} and v_{23} depend upon μ only through the factor e^{μ}, and v_{33} depends upon μ only through the factor $e^{2\mu}$.

The computation of the elements v^{ij} of the information matrix (multiplied by σ^2/n) and the inversion of this matrix and its submatrices and multiplication by σ^2 to obtain the coefficients of $1/n$ in the asymptotic variances and covariances were performed on the IBM 1620 computer. The resulting coefficients of $1/n$ in Var $(\hat{\mu})$, Var $(\hat{\sigma})$, Var $(\hat{\tau})$, Cov $(\hat{\mu},\hat{\sigma})$, Cov $(\hat{\mu},\hat{\tau})$, and Cov $(\hat{\sigma},\hat{\tau})$ are given in Table F2A for $\mu=2$, $\sigma=1$ and in Table F2B for $\mu=4$, $\sigma=2$ with censoring proportions $q_1=0.00,0.01,0.02,0.05,0.1$, and $q_2=0.0(0.1)0.9$ (excluding $q_1=0.1$, $q_2=0.9$) together with the coefficients of $1/n$ in the variances and covariances when one parameter is known and in the variances when two parameters are known. For $\sigma=1$ or $\sigma=2$ and other values of μ, the coefficients can be obtained from the tabular values in Table F2A or Table F2B by multiplying by the proper exponential function of μ, but for other values of σ the computations must be made afresh. The coefficients tabulated are those of the local-maximum-likelihood estimators resulting from the iterative estimation procedure which will be discussed in subsection 2.4, not those of the global maxima. This fact is verified by the results of a Monte Carlo study, which will be reported in subsection 2.5, comparing variances and covariances of estimates obtained from 500 random samples of each of various sizes and various degrees of censoring with those given by the asymptotic formulas.

2.4. ITERATIVE ESTIMATION PROCEDURE

The procedure for iterative estimation on a high-speed computer involves estimating the three parameters, one at a time, in the cyclic order μ, σ, τ, omitting any assumed to be known. Assuming that the first m order statistics of a sample of size n $(m\leq n)$ are known, except for the first r_0 $(0\leq r_0\leq m-p$, where $p=1, 2,$ or 3 is the number of parameters to be estimated), one starts by setting $r=r_0$. One then chooses initial estimates for the unknown parameters.

At each step, the rule of false position (iterative linear interpolation) is used to determine the value (if any) of the parameter then being estimated which satisfies the appropriate likelihood equation, in which the latest estimates (or known values) of the other two parameters have been substituted. For $\hat{\tau}<x_{r_0+1}$, one can always find estimates $\hat{\mu}$(finite) and $\hat{\sigma}$(finite and positive) in this way. In estimating τ, however, one may find that no value of τ in the permissible interval $\tau\leq x_{r_0+1}$ satisfies Equation (5). In such cases, the likelihood function is monotone increasing, so that $\hat{\tau}=x_{r_0+1}$. As $\hat{\tau}\to x_{r_0+1}$, $\hat{\mu}\to-\infty$ and $\hat{\sigma}\to+\infty$, so that the estimation is proceeding along a path to the global maximum [see Hill (1963)]. When this occurs, which is not unusual when the available sample (after censoring, if any) is small, it is still possible to obtain reason-

able estimates by a slight modification of the procedure. The modification entails censoring x_{r_0+1}, the smallest observation not previously censored, and any other equal to it, thus increasing r from r_0 to r_0+r_1, where $r_1 \geq 1$ is the number of observations censored at this point. Subsequently, x_{r_0+1} plays no role in the estimation procedure except as an upper bound on $\hat{\tau}$. Now the likelihood function is bounded and finite estimates $\hat{\mu}$ and $\hat{\sigma}$ are obtained. Iteration continues until the results of successive steps agree to within assigned tolerances (say 10^{-4}) or for a specified number of steps (say 550).

Use of the modified procedure calls for distributions of estimators which are conditional on the necessity for censoring the smallest previously uncensored observation(s). Lacking these, one may assert that the asymptotic variances of the estimators for the "sometimes censor" procedure are bounded below by those for the "never censor" procedure and above by those for the "always censor" procedure.

2.5. MONTE CARLO STUDY FOR SAMPLES OF MODERATE SIZE

In order to check the validity of the asymptotic variances and covariances determined in Section 3 and their applicability to samples of moderate size, a Monte Carlo study was carried out on the IBM 7094 computer. Five hundred pseudo-random samples each of sizes 50, 100, and 200 from a lognormal population with parameters $\mu=4$, $\sigma=2$, and $\tau=10$ were generated in the computer. The iterative procedure described in subsection 2.4 was used to estimate all three parameters, also every pair of parameters and every single parameter, the known values being substituted for the parameters not being estimated. In the case of samples of size 100, this was done not only for the complete samples but also for the samples with proportions $q_1=0.01$ censored from below and $q_2=0.5$ from above, both singly and in combination. The unmodified procedure converged to within the assigned tolerances of 10^{-4} in the specified 550 steps or fewer without exception. More severe censoring or the use of smaller samples can lead to a slower convergence of the iterative procedure as well as to the need to resort to the modified procedure.

The means, variances, and covariances of the estimates, based on 500 samples, are given in Table G2. A comparison of the means in Table G2 with the population parameters $\mu=4$, $\sigma=2$, and $\tau=10$ and a comparison of the variances and covariances in Table G2 with the asymptotic variances and covariances obtained by dividing the coefficients in Table F2B by the sample size leads one to the following tentative conclusions:

(1) The estimator $\hat{\mu}$ from complete samples has a negative bias which is approximately proportional to n^{-1}, the reciprocal of the sample size. The bias of $\hat{\mu}$ appears to be unaffected by knowledge of σ, but it is small or non-existent if τ is known. The bias remains negative for moderate censoring.

(2) The estimator $\hat{\sigma}$ has a positive bias when τ is unknown and a negative bias when τ is known. The magnitude of the bias is roughly inversely proportional to the number of observations remaining after censoring, and appears to be unaffected by knowledge of μ.

(3) The estimator $\hat{\tau}$ has a positive bias which is closely proportional to n^{-1}. The magnitude of the bias appears to be unaffected by knowledge of μ and/or σ and by censoring from above, but it appears to be slightly increased by censoring even a single observation from below.

(4) The variance of $\hat{\tau}$ for samples of moderate size in much larger than the value given by the asymptotic formula (see Table F2B). The excess over the asymptotic value, however, appears to be proportional to n^{-2}, whereas the asymptotic value itself is proportional to n^{-1}. Thus, for sufficiently large samples, the excess would become negligible in comparison with the asymptotic value. The excess appears to be decreased little if any by knowledge of μ and only slightly by knowledge of σ. The excess appears to be affected very little by censoring, but for censoring of even a single observation from below the asymptotic value increases markedly, so that the excess becomes smaller by comparison.

(5) When τ is known, the variances of $\hat{\mu}$ and $\hat{\sigma}$ are in close agreement with the values given by the asymptotic formulas. When τ is unknown, the variances of $\hat{\mu}$ and $\hat{\sigma}$ and their covariances with $\hat{\tau}$ are somewhat larger than the values given by the asymptotic formulas. The excess over the asymptotic value is greater for $\hat{\sigma}$ than for $\hat{\mu}$, as one would expect from the fact that $\hat{\sigma}$ is more strongly correlated with $\hat{\tau}$ than is $\hat{\mu}$.

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3. MAXIMUM-LIKELIHOOD ESTIMATION OF THREE PARAMETERS OF WEIBULL AND GAMMA POPULATIONS*

3.1. INTRODUCTION

A large number of authors have considered estimation of the parameters of Gamma (Pearson Type III) and Weibull populations by the method of moments, the method of maximum likelihood, and other methods. While the method of maximum likelihood was employed by Gauss (1809) in particular cases, its general use was first proposed by Fisher (1912). Fisher (1922) showed that for estimating the parameters of a Pearson Type III population, except when it closely approximates normality, the method of moments is inefficient, and examined in detail the properties of maximum-likelihood estimators. Further justification for the use of the method of maximum likelihood was given by Hotelling (1930) and by Doob (1934). Halperin (1952) proved under mild regularity conditions that the maximum-likelihood estimator of a single parameter from singly censored samples is consistent, asymptotically normally distributed and of minimum variance for large samples, outlined the proof of an extension of the theorem to the case of several parameters and indicated that his results would hold for more general censoring. Plackett (1958) showed that maximum-likelihood estimators are asymptotically linear and that the best linear unbiased estimators are asymptotically normal and efficient.

The method of maximum likelihood has been applied to the problem of estimating the parameters of the Gamma (Pearson Type III) population by a number of authors, including Fisher (1922), Masuyama and Kuroiwa (1951), Des Raj (1953), Chapman (1956), Greenwood and Durand (1960), Wilk, Gnanadesikan and Huyett (1962), Mickey, Mundle, Walker and Glinski (1963), and Harter and Moore (1965, 1967). It has also been used to estimate the parameters of the Weibull population by Kao (1956, 1958), Leone, Rutenberg and Topp (1960), Dubey (1963), Lehman (1963), Ravenis (1964), Cohen (1965), and Harter and Moore (1965, 1967). Only a few of these authors have given the information matrix. Dubey and Ravenis gave the information matrix for a complete (uncensored) sample from the three-parameter Weibull population, using a slightly different parameterization than the one we shall employ in this section. Cohen gave the information matrix for complete, singly censored, and progressively censored samples from a two-parameter Weibull population, and Harter and Moore (1967) gave it for doubly censored samples from three-parameter Weibull and Gamma populations. Two well-known populations are special cases of these. The negative exponential population is a special case (with shape parameter equal to 1) of both the Weibull population and the Gamma population. The chi-square population with ν degrees of freedom is a Gamma population with shape parameter $\alpha = \nu/2$.

In this section, maximum-likelihood estimators are given for doubly censored samples from three-parameter Weibull and Gamma populations, together with a completely computerized procedure for iterative solution of the likelihood equations and a workable modification for use when the usual procedure breaks down, which occurs when the location parameter is unknown or known to be equal to the first order statistic of the sample and the estimate of the shape parameter is less than or equal to one. The mathematical formulation is given for the Gamma population in subsection 3.2.1 and for the Weibull population in subsection 3.2.2. The iterative procedure for solving the likelihood equations is given in subsection 3.3, and numerical examples in subsection 3.4. The elements of the maximum-likelihood information matrices for doubly censored samples from three-parameter Weibull and Gamma populations are given in subsections 3.5.1 and 3.5.2, respectively. Numerical inversion of the information matrices to obtain the asymptotic variance-covariance matrices is discussed in subsection 3.5.3, and the results for some typical values of the shape parameters and proportions censored are given in Tables F3 and F4. Results of a Monte Carlo study for the Weibull population are reported in subsection 3.6 and tabulated in Table G3. Some remarks on regular and non-regular estimation are given in subsection 3.7.

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*Earlier versions of portions of this material were published by Harter and Moore (1965, 1967).

3.2. MATHEMATICAL FORMULATION

3.2.1. GAMMA POPULATION

The probability density function of the random variable X having a Gamma distribution with location parameter $c \geq 0$, scale parameter θ, and shape parameter α is given by

$$g(x; c, \theta, \alpha) = [1/\Gamma(\alpha)\theta][(x-c)/\theta]^{\alpha-1} \exp[-(x-c)/\theta], \quad \theta, \alpha > 0, \; x \geq c \geq 0. \tag{1}$$

The natural logarithm of the likelihood function of the $(m-r)$ order statistics $X_{r+1}, X_{r+2}, \ldots, X_m$ of a sample of size n is given by

$$L_{r+1,m} = \ln n! - \ln (n-m)! - \ln r! - n \ln \Gamma(\alpha) - (m-r)\alpha \ln \theta + (\alpha-1) \sum_{i=r+1}^{m} \ln (x_i - c)$$

$$- \sum_{i=r+1}^{m} (x_i - c)/\theta + (n-m) \ln \{\Gamma(\alpha) - \Gamma[\alpha; (x_m - c)/\theta]\} + r \ln \Gamma[\alpha; (x_{r+1} - c)/\theta] \tag{2}$$

where $\Gamma(\alpha; z) = \int_0^z t^{\alpha-1} \exp(-t)dt$ is the incomplete Gamma function. The likelihood equations are obtained by equating to zero the partial derivatives of $L = L_{r+1,m}$ with respect to each of the three parameters, which are given by

$$\partial L/\partial\theta = -(m-r)\alpha/\theta + \sum_{i=r+1}^{m} (x_i - c)/\theta^2$$

$$+ (n-m)(x_m - c)^{\alpha} \exp[-(x_m - c)/\theta]/\theta^{\alpha+1}\{\Gamma(\alpha) - \Gamma[\alpha; (x_m - c)/\theta]\}$$

$$- r(x_{r+1} - c)^{\alpha} \exp[-(x_{r+1} - c)/\theta]/\theta^{\alpha+1}\Gamma[\alpha; (x_{r+1} - c)/\theta], \tag{3}$$

$$\partial L/\partial\alpha = -(m-r) \ln \theta + \sum_{i=r+1}^{m} \ln (x_i - c) - n\Gamma'(\alpha)/\Gamma(\alpha)$$

$$+ (n-m)\{\Gamma'(\alpha) - \Gamma'[\alpha; (x_m - c)/\theta]\}/\{\Gamma(\alpha) - \Gamma[\alpha; (x_m - c)/\theta]\}$$

$$+ r\Gamma'[\alpha; (x_{r+1} - c)/\theta]/\Gamma[\alpha; (x_{r+1} - c)/\theta], \tag{4}$$

$$\partial L/\partial c = (1-\alpha) \sum_{i=r+1}^{m} (x_i - c)^{-1} + (m-r)/\theta$$

$$+ (n-m)(x_m - c)^{\alpha-1} \exp[-(x_m - c)/\theta]/\theta^{\alpha}\{\Gamma(\alpha) - \Gamma[\alpha; (x_m - c)/\theta]\}$$

$$- r(x_{r+1} - c)^{\alpha-1} \exp[-(x_{r+1} - c)/\theta]/\theta^{\alpha}\Gamma[\alpha; (x_{r+1} - c)/\theta], \tag{5}$$

where the primes in Equation (4) indicate differentiation with respect to α.

3.2.2. WEIBULL POPULATION

The probability density function of the random variable X having a Weibull distribution with location parameter $c \geq 0$, scale parameter θ, and shape parameter K is given by

$$g(x; c, \theta, K) = [K(x-c)^{K-1}/\theta^{K}] \exp\{-[(x-c)/\theta]^{K}\}, \quad \theta, K > 0, \; x \geq c \geq 0. \tag{6}$$

The natural logarithm of the likelihood function of the $(m-r)$ order statistics $X_{r+1}, X_{r+2}, \ldots, X_m$ of a sample of size n is given by

$$L_{r+1,m} = \ln n! - \ln (n-m)! - \ln r! + (m-r)(\ln K - K \ln \theta) + (K-1) \sum_{i=r+1}^{m} \ln (x_i - c)$$

$$- \sum_{i=r+1}^{m} [(x_i - c)/\theta]^{K} - (n-m)[(x_m - c)/\theta]^{K} + r \ln\{1 - \exp[-(x_{r+1} - c)^{K}/\theta^{K}]\}. \tag{7}$$

The likelihood equations are obtained by equating to zero the partial derivatives of $L = L_{r+1,m}$ with respect to each of the three parameters, which are given by

$$\partial L/\partial\theta = -K(m-r)/\theta + K\sum_{i=r+1}^{m}(x_i-c)^K/\theta^{K+1} + K(n-m)(x_m-c)^K/\theta^{K+1}$$
$$-Kr(x_{r+1}-c)^K \exp\left[-(x_{r+1}-c)^K/\theta^K\right]/\theta^{K+1}\{1-\exp\left[-(x_{r+1}-c)^K/\theta^K\right]\}, \quad (8)$$

$$\partial L/\partial K = (m-r)(1/K - \ln\theta) + \sum_{i=r+1}^{m}\ln(x_i-c) - \sum_{i=r+1}^{m}\left[(x_i-c)/\theta\right]^K \ln\left[(x_i-c)/\theta\right]$$
$$-(n-m)\left[(x_m-c)/\theta\right]^K \ln\left[(x_m-c)/\theta\right]$$
$$+r(x_{r+1}-c)^K \ln\left[(x_{r+1}-c)/\theta\right] \exp\left\{-\left[(x_{r+1}-c)/\theta\right]^K\right\}/\theta^K\{1-\exp\left[-(x_{r+1}-c)^K/\theta^K\right]\}, \quad (9)$$

$$\partial L/\partial c = (1-K)\sum_{i=r+1}^{m}(x_i-c)^{-1} + K\theta^{-K}\sum_{i=r+1}^{m}(x_i-c)^{K-1} + (n-m)K\theta^{-K}(x_m-c)^{K-1}$$
$$-Kr(x_{r+1}-c)^{K-1} \exp\left[-(x_{r+1}-c)^K/\theta^K\right]/\theta^K\{1-\exp\left[-(x_{r+1}-c)^K/\theta^K\right]\}. \quad (10)$$

3.3. ITERATIVE ESTIMATION PROCEDURE

Iterative procedures have been developed for finding the joint maximum-likelihood estimators of the parameters of Gamma and Weibull populations from complete or censored samples. These involve estimating the three parameters, one at a time, in the cyclic order θ, α[or K], and c, omitting any assumed to be known. Assuming that the first m order statistics of a sample of size $n\,(m \leq n)$ are known, one starts by setting $r=0$ (no censoring from below). One then chooses initial estimates for the unknown parameters.

At each step, the rule of false position (iterative linear interpolation) is used to determine the value (if any) of the parameter then being estimated which satisfies the appropriate likelihood equation, in which the latest estimates (or known values) of the other two parameters have been substituted. Positive values $\hat{\theta}$ and $\hat{\alpha}$[or $\hat{K}$] can always be found in this way. In estimating c, however, one may find that no value of c in the permissible interval $0 \leq c \leq x_1$ satisfies the likelihood equation obtained by equating to zero the right-hand side of Equation (5) [or Equation (10)]. In such cases, the likelihood function in that interval is either monotone decreasing, so that $\hat{c}=0$, or monotone increasing, so that $\hat{c}=x_1$. The latter situation occurs when $\hat{\alpha} \leq 1$[or $\hat{K} \leq 1$], since then the right-hand side of Equation (5)[or Equation (10)], for $r=0$, contains only positive terms. Once that has occurred, it is impossible to continue estimation with $r=0$, since some of the terms in the likelihood equations become infinite, so it is necessary to censor the smallest observation x_1 and any others equal to it (r observations in all). Subsequently, x_1 plays no role in the estimation procedure except as an upper bound on $\hat{c}$. Iteration continues until the results of successive steps agree to within some assigned tolerance.

3.4. NUMERICAL EXAMPLES

As illustrations, consider the simulated life tests, each on forty components, summarized in Tables VII.1 and VII.2. We shall suppose that the "data" in Table VII.1 represent observed failure times (in hours). Actually, they were obtained by random sampling from Gamma and Weibull populations, each with shape parameters 2 and 3. For each set of data, the appropriate iterative estimation procedure was carried out for $m = 10(10)40$ in the following cases: (1) all parameters unknown; (2) any two parameters unknown; and (3) any one parameter unknown. The resulting estimates are shown in Table VII.2.

The iterative estimation procedures for the parameters of Gamma and Weibull populations were programmed in FORTRAN and run on the IBM 7094 computer. Most cases required only a few seconds of machine time, and even the most difficult case took only about 2 minutes.

3.5. ASYMPTOTIC VARIANCES AND COVARIANCES

3.5.1. WEIBULL MAXIMUM-LIKELIHOOD INFORMATION MATRIX

The natural logarithm of the likelihood function for a sample of size n from a three-parameter Weibull population, the lowest r and the highest $n-m$ sample values having been censored, is given by Equation

(7), which can be rewritten in the form

$$L_{r+1,\,m} = \ln n! - \ln (n-m)! - \ln r! + (m-r)(\ln K - \ln \theta) + (K-1) \sum_{i=r+1}^{m} \ln z_i - \sum_{i=r+1}^{m} z_i^K - (n-m) z_m^K + r \ln F(z_{r+1}), \qquad (11)$$

where $z_i = (x_i - c)/\theta$, $F(z_i) = \int_0^{z_i} f(t)dt = 1 - \exp(-z_i^K)$, and $f(z_i) = K z_i^{K-1} \exp(-z_i^K)$.

TABLE VII.1. – *Simulated life test data – hours to failure of ordered random samples of 40 items*

G2 – Gamma population ($\theta = 100$, $\alpha = 2$, $c = 30$)

47	56	58	64	77	79	89	128	131	142
144	149	163	166	175	176	184	184	188	190
191	204	216	227	241	250	256	256	261	273
282	283	286	297	299	338	352	353	357	495

G3 – Gamma population ($\theta = 50$, $\alpha = 3$, $c = 20$)

25	54	56	67	69	79	91	102	108	109
113	126	132	134	139	143	153	156	156	166
174	178	181	182	194	198	202	202	217	231
236	246	246	251	263	272	276	343	352	392

W2 – Weibull population ($\theta = 100$, $K = 2$, $c = 10$)

15	20	27	42	42	43	44	46	64	65
65	68	68	71	74	75	75	76	77	78
92	95	100	102	102	112	113	116	117	124
124	126	127	134	149	152	153	161	168	205

W3 – Weibull population ($\theta = 100$, $K = 3$, $c = 20$)

40.9	52.2	53.2	59.4	60.0	66.8	77.3	78.0	79.7	81.1
81.4	85.4	86.0	86.3	87.4	88.5	89.9	92.4	93.0	93.2
108.7	109.3	111.6	113.1	114.2	117.7	121.6	121.9	127.6	128.0
129.7	130.8	134.1	137.5	139.2	140.3	153.0	153.8	183.3	185.1

TABLE VII.2. – *Estimates of parameters from first m order statistics of samples in Table VII.1*

	m	$\hat{\theta}$	$\hat{\theta}\|\alpha$	$\hat{\theta}\|c$	$\hat{\theta}\|\alpha, c$	$\hat{\alpha}$	$\hat{\alpha}\|\theta$	$\hat{\alpha}\|c$	$\hat{\alpha}\|\theta, c$	$\hat{c}$	$\hat{c}\|\theta$	$\hat{c}\|\alpha$	$\hat{c}\|\theta, \alpha$
G2	10	548.5	119.7	215.8	112.4	0.790	2.173	1.363	2.056	47.00	23.74	23.83	30.88
	20	68.0	98.6	103.2	99.1	3.203	1.931	1.940	1.980	0.00	32.90	30.73	30.17
	30	98.6	95.6	92.9	96.7	1.930	1.899	2.072	1.964	33.37	34.04	31.82	30.04
	40	53.9	86.3	72.8	88.8	3.851	1.776	2.441	1.900	0.00	37.90	35.00	29.53
G3	10	66.5	62.2	125.7	50.6	2.813	3.538	1.665	2.879	4.61	0.00	2.21	11.84
	20	57.9	62.0	92.5	53.8	3.227	3.611	1.952	3.020	0.00	0.00	2.77	13.08
	30	53.0	59.4	75.3	53.6	3.432	3.599	2.206	3.039	0.00	0.00	4.92	13.23
	40	45.6	55.7	60.8	51.8	3.844	3.549	2.555	3.007	0.00	0.00	8.19	13.09
	m	$\hat{\theta}$	$\hat{\theta}\|K$	$\hat{\theta}\|c$	$\hat{\theta}\|K, c$	$\hat{K}$	$\hat{K}\|\theta$	$\hat{K}\|c$	$\hat{K}\|\theta, c$	$\hat{c}$	$\hat{c}\|\theta$	$\hat{c}\|K$	$\hat{c}\|\theta, K$
W2	10	143.2	115.2	136.6	101.3	1.257	1.586	1.372	1.704	12.05	11.72	2.87	6.76
	20	90.8	87.1	83.8	84.8	2.787	2.484	2.091	1.779	0.00	0.00	8.30	4.14
	30	98.7	100.9	96.3	96.1	1.880	1.911	1.780	1.770	7.66	6.87	5.45	5.80
	40	101.8	96.2	92.8	93.3	2.199	2.156	1.945	1.988	2.48	3.75	6.79	5.23
W3	10	95.6	91.1	93.4	92.7	1.612	1.515	2.954	2.696	37.40	38.07	21.04	16.43
	20	100.6	76.0	81.7	84.8	5.226	5.199	3.747	2.699	0.00	0.54	27.25	11.67
	30	82.3	99.5	95.8	95.7	2.143	2.844	2.719	2.686	33.12	16.88	16.31	15.94
	40	83.5	101.6	95.5	97.0	2.330	2.844	2.715	2.775	30.80	16.69	14.86	16.18

In the case of complete samples, the standard procedure for finding the elements of the information matrix is to take the limits, as $n \to \infty$, of the negatives of the expected values of the second partial derivatives of the likelihood function with respect to the parameters. In the case of censored samples, these limits do not exist in the usual sense, but they can be replaced by limits in probability [see Halperin (1952)]. Let $q_1 = r/n$, $q_2 = (n-m)/n$, and $p = 1 - q_1 - q_2 = (m-r)/n$. As $n \to \infty$ (q_1 and q_2 fixed), z_{r+1} converges in probability to $\hat{z}_{r+1}$ where $F(\hat{z}_{r+1}) = \int_0^{\hat{z}_{r+1}} f(t)dt = q_1$ and z_m converges in probability to $\hat{z}_m$ where $1 - F(\hat{z}_m) = \int_{\hat{z}_m}^{\infty} f(t)dt = q_2$. If one denotes by $E[\ \ldots\ ]$ a conditional expectation given z_{r+1} and z_m, the elements of the information matrix (multiplied by $1/n$) may be written as

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial\theta^2)\right] = \theta^{-2}\{-Kp + K(K+1)[\Gamma(2;\ \hat{z}_m^K) - \Gamma(2;\ \hat{z}_{r+1}^K)] + K(K+1)q_2\hat{z}_m^K$$

$$+ \hat{z}_{r+1}f(\hat{z}_{r+1})\ [K\hat{z}_{r+1}^K - (K+1)q_1]/q_1\} = v^{11}. \tag{12}$$

$$\lim \text{ pr } E\left[-\frac{1}{n}\ (\partial^2 L/\partial K^2)\right] = p/K^2 + [\Gamma''(2;\ \hat{z}_m^K) - \Gamma''(2;\ \hat{z}_{r+1}^K\ )]/K^2 + q_2\hat{z}_m^K \ln^2 \hat{z}_m$$

$$+ \hat{z}_{r+1}f(\hat{z}_{r+1})\ \ln^2 \hat{z}_{r+1}[\hat{z}_{r+1}^K\ - q_1]/Kq_1 = v^{22}, \tag{13}$$

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial c^2)\right] = \theta^{-2}\{(K-1)[\Gamma(1-2/K;\ \hat{z}_m^K) - \Gamma(1-2/K;\ \hat{z}_{r+1}^K)]$$

$$+ K(K-1)[\Gamma(2-2/K;\ \hat{z}_m^K) - \Gamma(2-2/K;\ \hat{z}_{r+1}^K)] + K(K-1)q_2\hat{z}_m^{K-2}$$

$$+ f(\hat{z}_{r+1})[K\hat{z}_{r+1}^K - (K-1)q_1]/q_1\hat{z}_{r+1}\} = v^{33}, \tag{14}$$

$$\lim \text{ pr } E\left[-\frac{1}{n}\ (\partial^2 L/\partial\theta\partial K)\right] = \theta^{-1}\{p - [\Gamma'(2;\ \hat{z}_m^K) - \Gamma'(2;\ \hat{z}_{r+1}^K)]$$

$$- [\Gamma(2;\ \hat{z}_m^K) - \Gamma(2;\ \hat{z}_{r+1}^K)] - q_2\hat{z}_m^K(K \ln \hat{z}_m + 1)$$

$$- \hat{z}_{r+1}f(\hat{z}_{r+1})\ [K\hat{z}_{r+1}^K \ln \hat{z}_{r+1} - (K \ln \hat{z}_{r+1} + 1)q_1]/Kq_1\} = v^{12}, \tag{15}$$

$$\lim \text{ pr } E\left[-\frac{1}{n}\ (\partial^2 L/\partial\theta\partial c)\right] = \theta^{-2}\{K^2[\Gamma(2-1/K;\ \hat{z}_m^K) - \Gamma(2-1/K;\ \hat{z}_{r+1}^K)] + K^2q_2\hat{z}_m^{K-1}$$

$$+ Kf(\hat{z}_{r+1})\ [\hat{z}_{r+1}^K - q_1]/q_1\} = v^{13}, \tag{16}$$

$$\lim \text{ pr } E\left[-\frac{1}{n}\ (\partial^2 L/\partial K\partial c)\right] = \theta^{-1}\{[\Gamma(1-1/K;\ \hat{z}_m^K) - \Gamma(1-1/K;\ \hat{z}_{r+1}^K)] - [\Gamma(2-1/K;\ \hat{z}_m^K)$$

$$- \Gamma(2-1/K;\ \hat{z}_{r+1}^K)] - [\Gamma'(2-1/K;\ \hat{z}_m^K) - \Gamma'(2-1/K;\hat{z}_{r+1}^K)] - q_2\hat{z}_m^{K-1}(K \ln \hat{z}_m + 1)$$

$$- f(\hat{z}_{r+1})\ [K\hat{z}_{r+1}^K \ln \hat{z}_{r+1} - (K \ln \hat{z}_{r+1} + 1)q_1]/Kq_1\} = v^{23}, \tag{17}$$

where the definition $\Gamma(s;\ b) = \int_0^b t^{s-1}e^{-t}\ dt$ of the incomplete Gamma function for $s > 0$ is extended to cases in which $s \leq 0$, the terms involving $q_1(q_2)$ drop out when $q_1(q_2) = 0$, and the primes indicate differentiation $[\Gamma'(a;\ b) = \partial\Gamma(s;\ b)/\partial s|_{s=a}]$.

The natural logarithm of the likelihood function for a sample of size n from a three-parameter Gamma population, the lowest r and the highest $n-m$ sample values having been censored, is given by Equation (2), which can be rewritten in the form

$$L_{r+1,\,m} = \ln n! - \ln (n-m)! - \ln r! - (m-r)[\ln \Gamma(\alpha) + \ln \theta] + (\alpha - 1) \sum_{i=r+1}^{m} \ln z_i - \sum_{i=r+1}^{m} z_i + (n-m) \ln [1 - F(z_m)] + r \ln F(z_{r+1}), \qquad (18)$$

where $z_i = (x_i - c)/\theta$, $F(z_i) = \int_0^{z_i} f(t)dt = \Gamma(\alpha;\, z_i)/\Gamma(\alpha)$, and $f(z_i) = z_i^{\alpha-1} \exp(-z_i)/\Gamma(\alpha)$.

As in the case of the Weibull population, the elements of the information matrix can be found by taking the expected values of the limits in probability of the negatives of the second partial derivatives of the likelihood function with respect to the parameters. Let $q_1 = r/n$, $q_2 = (n-m)/n$, and $p = 1 - q_1 - q_2 = (m-r)/n$. As $n \to \infty$ (q_1 and q_2 fixed), z_{r+1} converges in probability to $\hat{z}_{r+1}$ where $F(\hat{z}_{r+1}) = \int_0^{\hat{z}_{r+1}} f(t)dt = q_1$ and z_m converges in probability to $\hat{z}_m$ where $1 - F(\hat{z}_m) = \int_{\hat{z}_m}^{\infty} f(t)dt = q_2$. The elements of the information matrix (multiplied by $1/n$) may be written as

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial\theta^2)\right] = \theta^{-2}\{-\alpha p + 2[\Gamma(\alpha+1;\, \hat{z}_m) - \Gamma(\alpha+1;\, \hat{z}_{r+1})]/\Gamma(\alpha) - \hat{z}_m f(\hat{z}_m)[q_2(\hat{z}_m - \alpha - 1) - \hat{z}_m f(\hat{z}_m)]/q_2 + \hat{z}_{r+1} f(\hat{z}_{r+1})[q_1(\hat{z}_{r+1} - \alpha - 1) + \hat{z}_{r+1} f(\hat{z}_{r+1})]/q_1\} = v^{11}. \qquad (19)$$

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial\alpha^2)\right] = \{\Gamma(\alpha)\Gamma''(\alpha) - [\Gamma'(\alpha)]^2\}/[\Gamma(\alpha)]^2 - \{[\Gamma(\alpha) - \Gamma(\alpha;\, \hat{z}_m)][\Gamma''(\alpha) - \Gamma''(\alpha;\, \hat{z}_m)] - [\Gamma'(\alpha) - \Gamma'(\alpha;\, \hat{z}_m)]^2\}/q_2[\Gamma(\alpha)]^2 - \{\Gamma(\alpha;\, \hat{z}_{r+1})\Gamma''(\alpha;\, \hat{z}_{r+1}) - [\Gamma'(\alpha;\, \hat{z}_{r+1})]^2\}/q_1[\Gamma(\alpha)]^2 = v^{22}, \qquad (20)$$

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial c^2)\right] = \theta^{-2}\{(\alpha-1)[\Gamma(\alpha-2;\, \hat{z}_m) - \Gamma(\alpha-2;\, \hat{z}_{r+1})]/\Gamma(\alpha) - f(\hat{z}_m)[q_2(\hat{z}_m - \alpha + 1) - \hat{z}_m f(\hat{z}_m)]/q_2\hat{z}_m + f(\hat{z}_{r+1})[q_1(\hat{z}_{r+1} - \alpha + 1) + \hat{z}_{r+1} f(\hat{z}_{r+1})]/q_1\hat{z}_{r+1}\} = v^{33}. \qquad (21)$$

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial\theta\partial\alpha)\right] = \theta^{-1}\{p - \hat{z}_m f(\hat{z}_m)\{q_2 \ln \hat{z}_m - [\Gamma'(\alpha) - \Gamma'(\alpha;\, \hat{z}_m)]/\Gamma(\alpha)\}/q_2 + \hat{z}_{r+1} f(\hat{z}_{r+1})[q_1 \ln \hat{z}_{r+1} - \Gamma'(\alpha;\, \hat{z}_{r+1})/\Gamma(\alpha)]/q_1\} = v^{12}. \qquad (22)$$

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial\theta\partial c)\right] = \theta^{-2}\{p - f(\hat{z}_m)[q_2(\hat{z}_m - \alpha) - \hat{z}_m f(\hat{z}_m)]/q_2 + f(\hat{z}_{r+1})[q_1(\hat{z}_{r+1} - \alpha) + \hat{z}_{r+1} f(\hat{z}_{r+1})]/q_1\} = v^{13}. \qquad (23)$$

$$\lim \text{ pr } E\left[-\frac{1}{n}(\partial^2 L/\partial\alpha\partial c)\right] = \theta^{-1}\{[\Gamma(\alpha-1;\, \hat{z}_m) - \Gamma(\alpha-1;\, \hat{z}_{r+1})]/\Gamma(\alpha) - f(\hat{z}_m)\{q_2 \ln \hat{z}_m - [\Gamma'(\alpha) - \Gamma'(\alpha;\, \hat{z}_m)]/\Gamma(\alpha)\}/q_2 + f(\hat{z}_{r+1})[q_1 \ln \hat{z}_{r+1} - \Gamma'(\alpha;\, \hat{z}_{r+1})/\Gamma(\alpha)]/q_1\} = v^{23}. \qquad (24)$$

where the notation is the same as in Equations (12)–(17).

3.5.3. COMPUTATION OF ASYMPTOTIC VARIANCES AND COVARIANCES

For all cases in which estimation is regular, the asymptotic variance-covariance matrix for the estimators $\hat{\theta}$, $\hat{K}$ [or $\hat{\alpha}$], and $\hat{c}$ is given by $\frac{1}{n}[v_{ij}]$, where $[v_{ij}]=[v^{ij}]^{-1}$ and the v^{ij} are given by Equations (12)–(17) for the Weibull population and by Equations (19)–(24) for the Gamma population. The computation of the elements v^{ij} of the information matrix (multiplied by $1/n$) and the inversion of this matrix and its submatrices to obtain the coefficients of $1/n$ in the variance-covariance matrices for simultaneous estimation of all three parameters, or of one or two parameters when the other(s) are known, were performed on the IBM 7094 computer. Computation is quite straightforward when the shape parameter is greater than 2 and/or the location parameter is known; otherwise, one encounters quantities of the form $\Gamma(s;\, b)-\Gamma(s;\, a)$, with $s \leq 0$. These become infinite when $a=0$ and take the indeterminate form $\infty-\infty$ when $a>0$. In the latter case, one may use the alternate form $\int_a^b t^{s-1}e^{-t}\,dt$, which is finite and can be evaluated by numerical integration. Since $a=\hat{z}_{r+1}^{K}$ for the Weibull population and $a=\hat{z}_{r+1}$ for the Gamma population, $a=0$ if and only if $\hat{z}_{r+1}=0$, which is true if and only if $q_1=0$. Hence the asymptotic variances and covariances of the estimators have not been found when $q_1=0$, the location parameter is one of those being estimated, and the shape parameter K(Weibull) or α(Gamma) is less than or equal to 2. With this exception, the coefficients of $(1/n)$ times a power of the scale parameter θ in the asymptotic variances and covariances were computed for $q_1=0.000(0.005)0.025$, $q_2=0.00(0.25)0.75$, and shape parameters 1, 2, and 3, accurate to within a unit in the fifth decimal place. To attain this accuracy, it was necessary to perform the computations in double precision, since several significant digits may be lost in inverting the information matrix. The results, rounded to three decimal places, are given for Weibull populations with $K=1(1)3$ in Table F3 and for Gamma populations with $\alpha=1(1)3$ in Table F4. Interpolation in these tables will not always give accurate results, but the author has a computer program which can readily be used to obtain additional values.

It will be observed that the above procedure breaks down if estimation is non-regular [see subsection 3.7]. No systematic attempt has been made to determine the asymptotic variances and covariances of non-regular estimators, though this may be possible in some cases. It is known, for example [see Dubey (1965) and Blischke et al (1965)], that when the shape parameter is less than 2, the first order statistic is a hyper-efficient estimator of the location parameter; in particular, for the special case of the exponential population (shape parameter 1), this estimator has variance proportional to n^{-2} rather than to n^{-1} as in the case of regular estimators.

3.6. MONTE CARLO STUDY FOR SAMPLES OF MODERATE SIZE

In order to check the rate of convergence of the variances and covariances to their asymptotic values, a limited Monte Carlo study was conducted in which 500 random samples each of sizes $n=50$ and $n=100$ were drawn from a Weibull population with location parameter $c=20$, scale parameter $\theta=10$, and shape parameter $K=3$ and the iterative procedure outlined in subsection 3.3 was used to estimate all three parameters, also every subset of one or two parameters with the other(s) known. The means, variances and covariances of the estimates from the complete samples were then computed, and the results are shown in Table G3, where the asymptotic values of the variances and covariances, found by multiplying coefficients read from Table F3 by the proper powers of θ and dividing by n, are shown in juxtaposition with the sample values for purposes of comparison. The results shown in Table G3 lead to the tentative conclusion that when all three parameters are unknown, the variances and the absolute values of the covariances exceed their asymptotic values, with the excess closely proportional to n^{-2}, a phenomenon previously observed by Harter and Moore (1966) [see subsection 2.5 of this chapter] in the case of local-maximum-likelihood estimators of the parameters of a three-parameter lognormal population; when at least one of the parameters is known, the sample variances and covariances agree quite well with their asymptotic values, even for sample size as small as 50.

3.7. REMARKS ON REGULAR AND NON-REGULAR ESTIMATION

Mickey, Mundle, Walker and Glinski (1963) have pointed out that maximum-likelihood estimation of the location parameter of a Gamma population from a complete sample is regular in the sense defined by Cramér (1946; p. 479) if and only if the value of the shape parameter is greater than two. It is a well-known

fact that the same is true for Weibull population. When the shape parameter is also one of those being estimated, one does not know whether estimation is regular or non-regular.

Harter and Moore (1967) have verified that the regularity conditions [see Kendall and Stuart (1961), pp. 43–44], where the parameter θ is interpreted as a vector, and the additional assumptions [see Halperin (1952)] necessary in the case of censored samples are satisfied if and only if at least one of the following conditions holds: (1) the shape parameter is greater than two; (2) the location parameter is known; (3) a proportion $q_1 > 0$ of the sample is censored from below. Therefore estimation is regular in all the cases for which asymptotic variances and covariances have been found by the methods of subsection 3.5 and tabulated in Tables F3 and F4, and the estimators are therefore asymptotically of minimum variance, unbiased, and trivariate normal. Thus one can always insure that estimation will be regular if he is willing to pay the price of censoring one or more observations from below. Doing this unnecessarily, however, results in loss of information, and often yields estimators with substantially larger variances. It is for this reason that we have proposed the modified procedure in which the first order statistic of the sample is censored only if the location parameter is being estimated and the known or estimated value of the shape parameter is less than or equal to one, which makes such action mandatory.

3.8. REFERENCES

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4. MAXIMUM-LIKELIHOOD ESTIMATION OF FOUR PARAMETERS OF GENERALIZED GAMMA POPULATION*

4.1. INTRODUCTION

Stacy (1962) has studied some of the elementary properties of a three-parameter generalized Gamma population which includes, as special cases, not only the two-parameter Gamma, but also the two-parameter Weibull, the one-parameter exponential and half-normal, and other populations of interest. Parr and Webster (1965) have obtained expressions for the maximum-likelihood estimators, from complete samples of size n, of the parameters of such a population and for their asymptotic variances and covariances. Stacy and Mihram (1965) have reparameterized the population, generalized it further to include cases in which the power parameter p is negative, and considered estimation of parameters by the methods of moments, maximum likelihood, and minimum variance.

The author believes that the usefulness of the generalized Gamma population in the study of life distributions, which has been recognized by Parr and Webster (1965), can be greatly enhanced by the addition of a fourth parameter, the location parameter c, which the above authors have assumed to be zero. In addition, he has found that it is often necessary or desirable to estimate population parameters from censored samples. Therefore he has devised an iterative procedure for maximum-likelihood estimation, from complete and censored samples, of the parameters of a four-parameter generalized Gamma population. In this section the mathematical formulation, the iterative estimation procedure, and numerical examples of its use are given, together with a discussion of the method of computation of the asymptotic variances and covariances of the ML estimators, which are tabulated in Table F5 for various parameter values and censoring proportions.

4.2. THE FOUR-PARAMETER GENERALIZED GAMMA POPULATION

The probability density function of the random variable X having a four-parameter generalized Gamma distribution with location parameter c, scale parameter a, shape/power parameter b, and power parameter p (shape parameter $d=bp$) is given by

$$f(x;\, c,\, a,\, b,\, p)=p(x-c)^{bp-1}\exp\{-[(x-c)/a]^p\}/a^{bp}\Gamma(b),\ a,\ b,\ p>0,\ x\geq c\geq 0. \tag{1}$$

From a mathematical standpoint, there is no reason why c cannot be negative, and Stacy and Mihram (1965) have introduced a simple modification which allows p to be negative, but since negative values of either c or p are not of much interest, at least from the point of view of life distributions, we assume that c and p are non-negative. The corresponding cumulative distribution function is given by

$$F(x;\, c,\, a,\, b,\, p)=\Gamma\{b;\,[(x-c)/a]^p\}/\Gamma(b), \tag{2}$$

where $\Gamma(b;\, y)=\int_0^y t^{b-1}e^{-t}\,dt$ is the incomplete Gamma function. The fact that the cumulative distribution function of this population is an incomplete Gamma-function ratio, as is that of the Gamma population, suggests the name generalized Gamma population, though it is also a generalization of the three-parameter Weibull population and of other populations as well. Specifically, one may mention the following populations as special cases: three-parameter Gamma ($p=1$); three-parameter Weibull ($b=1$); two-parameter exponential ($b=p=1$); and two-parameter half-normal ($b=1/2$, $p=2$). If, in addition, one sets the location parameter c equal to zero in any one of these populations, the result is the same population with the number of parameters decreased by one.

*Earlier versions of portions of this material were published by Harter (1966, 1967).

The natural logarithm of the likelihood function of a sample of size n from the generalized Gamma population whose pdf and cdf are given by Equations (1) and (2) respectively, the lowest r and the highest $(n-m)$ sample values having been censored, is given by

$$L_{r+1,m}=\ln n!-\ln r!-\ln (n-m)!+(m-r)\ (\ln p-\ln a)+(bp-1)\sum_{i=r+1}^{m}\ln z_i-\sum_{i=r+1}^{m}z_i^p$$
$$-n\ln\Gamma(b)+r\ln\Gamma(b;\,z_{r+1}^p)+(n-m)\ln[\Gamma(b)-\Gamma(b;\,z_m^p)], \qquad (3)$$

where $z_i=(x_i-c)/a$. If there is no censoring from above (below) the last (next-to-last) term drops out. The first partial derivatives of $L=L_{r+1,m}$ with respect to the parameters are given by

$$\partial L/\partial a=a^{-1}\{-bp(m-r)+p\,\Sigma\,z_i^p-rz_{r+1}f(z_{r+1})/F(z_{r+1})+(n-m)z_mf(z_m)/[1-F(z_m)]\}, \qquad (4)$$

$$\partial L/\partial b=p\,\Sigma\ln z_i-n\Gamma'(b)/\Gamma(b)+r\Gamma'(b;\,z_{r+1}^p)/\Gamma(b)F(z_{r+1})$$
$$+(n-m)\,[\Gamma'(b)-\Gamma'(b;\,z_m^p)]/\Gamma(b)\,[1-F(z_m)], \qquad (5)$$

$$\partial L/\partial p=(m-r)/p+b\,\Sigma\ln z_i-\Sigma\,z_i^p\ln z_i+rf(z_{r+1})\ln z_{r+1}/pF(z_{r+1})$$
$$-(n-m)f(z_m)\ln z_m/p[1-F(z_m)], \qquad (6)$$

$$\partial L/\partial c=a^{-1}\{(1-bp)\,\Sigma\,z_i^{-1}+p\,\Sigma\,z_i^{p-1}-rf(z_{r+1})/F(z_{r+1})+(n-m)f(z_m)/[1-F(z_m)]\}, \qquad (7)$$

where the primes in Equation (5) indicate differentiation with respect to b, all summations are for i running from $r+1$ through m, and where

$$f(z_i)=pz_i^{bp-1}\exp(-z_i^p)/\Gamma(b),\ F(z_i)=\int_0^{z_i}f(t)dt=\Gamma(b;\,z_i^p)/\Gamma(b).$$

The second partial derivatives of L with respect to the parameters are given by

$$\partial^2L/\partial a^2=a^{-2}\{bp(m-r)-p(p+1)\Sigma z_i^p-rz_{r+1}f(z_{r+1})[z_{r+1}f(z_{r+1})-(bp+1-pz_{r+1}^p)F(z_{r+1})]F^2(z_{r+1})$$
$$-(n-m)z_mf(z_m)\{z_mf(z_m)+(bp+1-pz_m^p)[1-F(z_m)]\}/[1-F(z_m)]^2\}. \qquad (8)$$

$$\partial^2L/\partial b^2=-n\{\Gamma(b)\Gamma''(b)-[\Gamma'(b)]^2\}/[\Gamma(b)]^2+r\{\Gamma(b;z_{r+1}^p)\Gamma''(b;z_{r+1}^p)-[\Gamma'(b;z_{r+1}^p)]^2\}/[\Gamma(b)F(z_{r+1})]^2$$
$$+(n-m)\{[\Gamma(b)-\Gamma(b;\,z_m^p)][\Gamma''(b)-\Gamma''(b;\,z_m^p)]-[\Gamma'(b)-\Gamma'(b;\,z_m^p)]^2\}/\{\Gamma(b)[1-F(z_m)]\}^2, \qquad (9)$$

$$\partial^2L/\partial p^2=-(m-r)p^2-\Sigma z_i^p\ln^2z_i-rz_{r+1}f(z_{r+1})\ln^2z_{r+1}[z_{r+1}f(z_{r+1})-p(b-z_{r+1}^p)F(z_{r+1})]/p^2F^2(z_{r+1})$$
$$-(n-m)z_mf(z_m)\ln^2z_m\{z_mf(z_m)+p(b-z_m^p)[1-F(z_m)]\}/p^2[1-F(z_m)]^2. \qquad (10)$$

$$\partial^2L/\partial c^2=a^{-2}\{(1-bp)\Sigma z_i^{-2}-p(p-1)\Sigma z_i^{p-2}-rf(z_{r+1})[z_{r+1}f(z_{r+1})-(bp-1-pz_{r+1}^p)F(z_{r+1})]/$$
$$z_{r+1}F^2(z_{r+1})-(n-m)f(z_m)\{z_mf(z_m)+(bp-1-pz_m^p)[1-F(z_m)]\}/z_m[1-F(z_m)]^2\}, \qquad (11)$$

$$\partial^2L/\partial a\partial b=a^{-1}\{-p(m-r)-rz_{r+1}f(z_{r+1})\,[p\ln z_{r+1}F(z_{r+1})-\Gamma'(b;\,z_{r+1}^p)/\Gamma(b)]/F^2(z_{r+1})$$
$$+(n-m)z_mf(z_m)\{p\ln z_m[1-F(z_m)]-[\Gamma'(b)-\Gamma'(b;\,z_m^p)]/\Gamma(b)\}/[1-F(z_m)]^2\}. \qquad (12)$$

$$\partial^2L/\partial a\partial p=a^{-1}\{-b(m-r)+p\Sigma z_i^p\ln z_i+\Sigma z_i^p+rz_{r+1}f(z_{r+1})\{z_{r+1}f(z_{r+1})\ln z_{r+1}$$
$$-[1+p\ln z_{r+1}(b-z_{r+1}^p)]F(z_{r+1})\}/pF^2(z_{r+1})+(n-m)z_mf(z_m)\{z_mf(z_m)\ln z_m$$
$$+[1+p\ln z_m(b-z_m^p)][1-F(z_m)]\}/p[1-F(z_m)]^2\}. \qquad (13)$$

$$\partial^2 L/\partial a\partial c = a^{-2}\{-p^2\Sigma z_i^{p-1} - rf(z_{r+1})[z_{r+1}f(z_{r+1}) - p(b-z_{r+1}^p)F(z_{r+1})]/F^2(z_{r+1})$$
$$-(n-m)f(z_m)\{z_m f(z_m) + p(b-z_m^p)[1-F(z_m)]\}/[1-F(z_m)]^2\}, \quad (14)$$

$$\partial^2 L/\partial b\partial p = \Sigma \ln z_i - rz_{r+1}f(z_{r+1})\ln z_{r+1}[\Gamma'(b; z_{r+1}^p)/\Gamma(b) - p\ln z_{r+1}F(z_{r+1})]/pF^2(z_{r+1})$$
$$+(n-m)z_m f(z_m)\ln z_m\{[\Gamma'(b)-\Gamma'(b; z_m^p)]/\Gamma(b) - p\ln z_m[1-F(z_m)]\}/p[1-F(z_m)]^2\}, \quad (15)$$

$$\partial^2 L/\partial b\partial c = a^{-1}\{-p\Sigma z_i^{-1} - rf(z_{r+1})[p\ln z_{r+1}F(z_{r+1}) - \Gamma'(b; z_{r+1}^p)/\Gamma(b)]/F^2(z_{r+1})$$
$$+(n-m)f(z_m)\{p\ln z_m[1-F(z_m)] - [\Gamma'(b)-\Gamma'(b; z_m^p)]/\Gamma(b)\}/[1-F(z_m)]^2\}, \quad (16)$$

$$\partial^2 L/\partial p\partial c = a^{-1}\{-b\Sigma z_i^{-1} + p\Sigma z_i^{p-1}\ln z_i + \Sigma z_i^{p-1} + rf(z_{r+1})\{z_{r+1}f(z_{r+1})\ln z_{r+1}$$
$$-[1+p\ln z_{r+1}(b-z_{r+1}^p)]F(z_{r+1})\}/pF^2(z_{r+1}) + (n-m)f(z_m)\{z_m f(z_m)\ln z_m$$
$$+[1+p\ln z_m(b-z_m^p)][1-F(z_m)]\}/p[1-F(z_m)]^2\}. \quad (17)$$

4.4. MAXIMUM-LIKELIHOOD INFORMATION MATRIX

The elements of the maximum-likelihood information matrix are the limits, as $n\to\infty$, of the negatives of the expected values of the second partial derivatives of the likelihood function with respect to the parameters. Let $q_1 = r/n$, $q_2 = (n-m)/n$, and $q = 1-q_1-q_2 = (m-r)/n$. As $n\to\infty$ (q_1 and q_2 fixed), $E(z_{r+1})\to\hat{z}_{r+1}$ where

$$F(\hat{z}_{r+1}) = \int_0^{\hat{z}_{r+1}} f(t)dt = q_1,\ E(z_m)\to\hat{z}_m \text{ where } 1-F(\hat{z}_m) = \int_{\hat{z}_m}^{\infty} f(t)dt = q_2,$$

$$E\left(\sum z_i^s\right)\to n\int_{\hat{z}_{r+1}}^{\hat{z}_m} t^s f(t)dt = n[\Gamma(b+s/p;\ \hat{z}_m^p) - \Gamma(b+s/p;\ \hat{z}_{r+1}^p)]/\Gamma(b),$$

$$E\left(\sum z_i^s \ln z_i\right)\to n\int_{\hat{z}_{r+1}}^{\hat{z}_m} t^s f(t)\ln t\,dt = n[\Gamma'(b+s/p;\ \hat{z}_m^p) - \Gamma'(b+s/p;\ \hat{z}_{r+1}^p)]/p\Gamma(b),$$

$$E\left(\sum z_i^s \ln^2 z_i\right)\to n\int_{\hat{z}_{r+1}}^{\hat{z}_m} t^s f(t)\ln^2 t\,dt = n[\Gamma''(b+s/p;\ \hat{z}_m^p) - \Gamma''(b+s/p;\ \hat{z}_{r+1}^p)]/p^2\Gamma(b),$$

the primes indicating differentiation with respect to the argument $(b+s/p)$. The elements of the information matrix (multiplied by $1/n$) may be written as

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial a^2) = a^{-2}\{-bpq + p(p+1)[\Gamma(b+1;\ \hat{z}_m^p) - \Gamma(b+1;\ \hat{z}_{r+1}^p)]/\Gamma(b)$$
$$+\hat{z}_{r+1}f(\hat{z}_{r+1})[\hat{z}_{r+1}f(\hat{z}_{r+1}) - (bp+1-p\hat{z}_{r+1}^p)q_1]/q_1$$
$$+\hat{z}_m f(\hat{z}_m)[\hat{z}_m f(\hat{z}_m) + (bp+1-p\hat{z}_m^p)q_2]/q_2\} = v^{11}, \quad (18)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial a\partial b) = a^{-1}\{pq + \hat{z}_{r+1}f(\hat{z}_{r+1})[pq_1\ln\hat{z}_{r+1} - \Gamma'(b;\ \hat{z}_{r+1}^p)/\Gamma(b)]/q_1$$
$$-\hat{z}_m f(\hat{z}_m)\{pq_2\ln\hat{z}_m - [\Gamma'(b) - \Gamma'(b;\ \hat{z}_m^p)]/\Gamma(b)\}/q_2\} = v^{12}, \quad (19)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial a\partial p) = a^{-1}\{bq - [\Gamma'(b+1;\ \hat{z}_m^p) - \Gamma'(b+1;\ \hat{z}_{r+1}^p)]/\Gamma(b) - [\Gamma(b+1;\ \hat{z}_m^p)$$
$$-\Gamma(b+1;\ \hat{z}_{r+1}^p)]/\Gamma(b) - \hat{z}_{r+1}f(\hat{z}_{r+1})\{\hat{z}_{r+1}f(\hat{z}_{r+1})\ln\hat{z}_{r+1} - [1+p\ln\hat{z}_{r+1}(b-\hat{z}_{r+1}^p)]q_1\}/pq_1$$
$$-\hat{z}_m f(\hat{z}_m)\{\hat{z}_m f(\hat{z}_m)\ln\hat{z}_m + [1+p\ln\hat{z}_m(b-\hat{z}_m^p)]q_2\}/pq_2\} = v^{13}, \quad (20)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial a\partial c)=a^{-2}\{p^2[\Gamma(b+1-1/p;\,\hat{z}_m^k)-\Gamma(b+1-1/p;\,\hat{z}_{r+1}^p]/\Gamma(b)$$
$$+f(\hat{z}_{r+1})[\hat{z}_{r+1}f(\hat{z}_{r+1})-p(b-\hat{z}_{r+1}^p)q_1]/q_1+f(\hat{z}_m)[\hat{z}_m f(\hat{z}_m)+p(b-\hat{z}_m^p)q_2]/q_2\}=v^{14}, \quad (21)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial b^2)=\{\Gamma(b)\Gamma''(b)-[\Gamma'(b)]^2\}/[\Gamma(b)]^2-\{q_1\Gamma''(b;\,\hat{z}_{r+1}^p)-[\Gamma'(b;\,\hat{z}_{r+1}^p)]^2$$
$$/\Gamma(b)\}/q_1\Gamma(b)-\{q_2[\Gamma''(b)-\Gamma''(b;\,\hat{z}_m^p)]-[\Gamma'(b)-\Gamma'(b;\,\hat{z}_m^p)]^2/\Gamma(b)\}/q_2\Gamma(b)=v^{22}, \quad (22)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial b\partial p)=-[\Gamma'(b;\,\hat{z}_m^p)-\Gamma'(b;\,\hat{z}_{r+1}^p)]/p\Gamma(b)$$
$$+\hat{z}_{r+1}f(\hat{z}_{r+1})\ln\hat{z}_{r+1}[\Gamma'(b;\,\hat{z}_{r+1}^p)/\Gamma(b)-pq_1\ln\hat{z}_{r+1}]/pq_1$$
$$-\hat{z}_m f(\hat{z}_m)\ln\hat{z}_m\{[\Gamma'(b)-\Gamma'(b;\,\hat{z}_m^p)]/\Gamma(b)-pq_2\ln\hat{z}_m\}/pq_2=v^{23}, \quad (23)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial b\partial c)=a^{-1}\{p[\Gamma(b-1/p;\,\hat{z}_m^p)-\Gamma(b-1/p;\,\hat{z}_{r+1}^p)]/\Gamma(b)+f(\hat{z}_{r+1})[pq_1\ln\hat{z}_{r+1}$$
$$-\Gamma'(b;\,\hat{z}_{r+1}^p)/\Gamma(b)]/q_1-f(\hat{z}_m)\{pq_2\ln\hat{z}_m-[\Gamma'(b)-\Gamma'(b;\,\hat{z}_m^p)]/\Gamma(b)\}/q_2\}=v^{24}, \quad (24)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial p^2)=q/p^2+[\Gamma''(b+1;\,\hat{z}_m^p)-\Gamma''(b+1;\,\hat{z}_{r+1}^p)]/p^2\Gamma(b)$$
$$+\hat{z}_{r+1}f(\hat{z}_{r+1})\ln^2\hat{z}_{r+1}[\hat{z}_{r+1}f(\hat{z}_{r+1})-p(b-\hat{z}_{r+1}^p)q_1]/p^2q_1$$
$$+\hat{z}_m f(\hat{z}_m)\ln^2\hat{z}_m[\hat{z}_m f(\hat{z}_m)+p(b-\hat{z}_m^p)q_2]/p^2q_2=v^{33}, \quad (25)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial p\partial c)=a^{-1}\{b[\Gamma(b-1/p;\,\hat{z}_m^p)-\Gamma(b-1/p,\,\hat{z}_{r+1}^p)]/\Gamma(b)$$
$$-[\Gamma'(b+1-1/p;\,\hat{z}_m^p)-\Gamma'(b+1-1/p;\,\hat{z}_{r+1}^p)]/\Gamma(b)-[\Gamma(b+1-1/p;\,\hat{z}_m^p)-\Gamma(b+1-1/p;\,\hat{z}_{r+1}^p)]/\Gamma(b)$$
$$-f(\hat{z}_{r+1})\{\hat{z}_{r+1}f(\hat{z}_{r+1})\ln\hat{z}_{r+1}-[1+p\ln\hat{z}_{r+1}(b-\hat{z}_{r+1}^p)]q_1\}/pq_1$$
$$-f(\hat{z}_m)\{\hat{z}_m f(\hat{z}_m)\ln\hat{z}_m+[1+p\ln\hat{z}_m(b-\hat{z}_m^p)]q_2\}/pq_2\}=v^{34}, \quad (26)$$

$$\lim_{n\to\infty}(-1/n)E(\partial^2 L/\partial c^2)=a^{-2}\{(bp-1)[\Gamma(b-2/p;\,\hat{z}_m^p)-\Gamma(b-2/p;\,\hat{z}_{r+1}^p)]/\Gamma(b)$$
$$+p(p-1)[\Gamma(b+1-2/p;\,\hat{z}_m^p)-\Gamma(b+1-2/p;\,\hat{z}_{r+1}^p)]/\Gamma(b)$$
$$+f(\hat{z}_{r+1})[\hat{z}_{r+1}f(\hat{z}_{r+1})-(bp-1-p\hat{z}_{r+1}^p)q_1]/q_1\hat{z}_{r+1}$$
$$+f(\hat{z}_m)[\hat{z}_m f(\hat{z}_m)+(bp-1-p\hat{z}_m^p)q_2]/q_2\hat{z}_m\}=v^{44}, \quad (27)$$

where the definition $\Gamma(s;\,u)=\int_0^u t^{s-1}e^{-t}dt$ for $s>0$ is extended to cases in which $s\leq 0$.

4.5. ASYMPTOTIC VARIANCES AND COVARIANCES

The asymptotic variance-covariance matrix for the maximum-likelihood estimators $\hat{a}$, $\hat{b}$, $\hat{p}$ and $\hat{c}$ is given by $n^{-1}[v_{ij}]$, where $[v_{ij}]=[v^{ij}]^{-1}$ and the v^{ij} are given by Equations (18)–(27) above. The computation of the elements v^{ij} of the information matrix (multiplied by $1/n$) and the inversion of this matrix to obtain the coefficients of $1/n$ in the variance-covariance matrix were performed on the IBM 7094 computer. Computation is quite straightforward when the shape parameter $d=bp$ is greater than 2, but when the shape parameter is less than or equal to 2, one encounters quantities of the form $\Gamma(s;\,\hat{z}_m^p)-\Gamma(s;\,\hat{z}_{r+1}^p)$, with $s\leq 0$, and when $p(b+1)\leq 1$ one also encounters quantities of the form $\Gamma'(s;\,\hat{z}_m^p)-\Gamma'(s;\,\hat{z}_{r+1}^p)$ with $s\leq 0$. These become infinite when $\hat{z}_{r+1}=0$ and take the indeterminate form $\infty-\infty$ when $\hat{z}_{r+1}>0$. In the latter case, one may use the alternate forms $\int_{\hat{z}_{r+1}^p}^{\hat{z}_m^p} t^{s-1}e^{-t}dt$ and $\int_{\hat{z}_{r+1}^p}^{\hat{z}_m^p} t^{s-1}e^{-t}\ln t\,dt$, which are finite and can be evaluated by numerical integration. Since $\hat{z}_{r+1}=0$ if and only if $q_1=0$, the asymptotic variances and covariances have

not been found when $q_1 = 0$ and the shape parameter is less than or equal to 2. With this exception, the coefficients of $(1/n)$ times a power of the scale parameter a in the asymptotic variances and covariances were computed for $q_1 = 0.000(0.005)0.025$ and $q_2 = 0.00(0.25)0.75$ for the following cases: $b = 1$, $p = 3$ (Weibull with shape parameter 3); $b = 3$, $p = 1$ (Gamma with shape parameter 3); $b = 1$, $p = 2$ (Weibull with shape parameter 2); $b = 2$, $p = 1$ (Gamma with shape parameter 2); $b = p = 1$ (exponential); and $b = 0.5$, $p = 2$ (*half-normal*).

Asymptotic variances and covariances of the estimators of the remaining parameters when one or more of the parameters are known have also been calculated for the parameter values and censoring proportions mentioned above. This was accomplished by inverting all square submatrices of the information matrix obtained by deleting one or more rows and the corresponding column(s). When the location parameter c is known, estimation is regular even when $q_1 = 0$ and the shape parameter d is less than or equal to 2, so it was possible to compute asymptotic variances and covariances of the estimators of subsets of parameters not including c for the cases in which $q_1 = 0$, $d \leq 2$.

The coefficients of $1/n$ times the kth power of the shape parameter a in the asymptotic variances and covariances of the maximum-likelihood estimators of all four parameters or any subset thereof are given in Table F5, where $k = 2$ for Var $(\hat{a})$, Var $(\hat{c})$ and Cov $(\hat{a}, \hat{c})$; $k = 1$ for Cov $(\hat{a}, \hat{b})$, Cov $(\hat{a}, \hat{p})$, Cov $(\hat{b}, \hat{c})$ and Cov $(\hat{p}, \hat{c})$; and $k = 0$ for Var $(\hat{b})$, Var $(\hat{p})$, and Cov $(\hat{b}, \hat{p})$. The portion of the table for each combination of the censoring proportions q_1 (from below) and q_2 (from above) and the parameters b and p is divided into sections, the first of which gives the results for the complete set of parameters, with the results for the various subsets given in subsequent sections. In each section, the coefficients of the asymptotic variance and covariances of the scale parameter a are given in the first row and column, of the shape/power parameter b in the second, of the power parameter p in the third, and of the location parameter c in the fourth. Rows and columns corresponding to parameters assumed to be known are left blank. Blank rows at the end of a section are omitted to conserve space. Since the asymptotic variance-covariance matrices are symmetric about the main diagonal, the elements below this diagonal are omitted. The results, accurate to within a unit in the last place given, are arranged in the form

n Var $(\hat{a})/a^2$	n Cov $(\hat{a}, \hat{b})/a$	n Cov $(\hat{a}, \hat{p})/a$	n Cov $(\hat{a}, \hat{c})/a^2$
	nVar $(\hat{b})$	n Cov $(\hat{b}, \hat{p})$	n Cov $(\hat{b}, \hat{c})/a$
		n Var $(\hat{p})$	n Cov $(\hat{p}, \hat{c})/a$
			n Var $(\hat{c})/a^2$

4.6. ITERATIVE ESTIMATION PROCEDURE

The maximum-likelihood estimates of the parameters are the solutions of the likelihood equations obtained by equating to zero the first partial derivatives of the likelihood function with respect to the parameters, which are given by Equations (4)–(7). Since these equations do not have explicit solutions, it is necessary to resort to iterative solution on an electronic computer. Three iterative procedures were tried, singly and in various combinations—the rule of false position, the Newton-Raphson method, and the gradient method. The procedure found to give best results was a hybrid one, in which the rule of false position was used, for the first 120 iterations, to estimate the parameters, one at a time, in the cyclic order a, b, p, and c, omitting any assumed to be known. Assuming that the first m order statistics of a sample of size $n (m < n)$ are known, one starts by setting $r = 0$ (no censoring from below). One then chooses initial estimates for the unknown parameters. At each step, one determines the value (if any) of the parameter then being estimated which satisfies the appropriate likelihood equation, in which the latest estimates (or known values) of the other three parameters have been substituted. Positive values a, b, and p can always be found in this way. In estimating c, however, one may find that no value of c in the permissible interval $0 \leq c \leq x_1$ satisfies the likelihood equation obtained by equating to zero the partial derivative with respect to c as given by Equation (7). In such cases, the likelihood function in that interval is either monotone decreasing, so that $\hat{c} = 0$, or monotone increasing, so that $\hat{c} = x_1$. The latter situation occurs when $\hat{b}\hat{p} < 1$, since then the partial derivative

with respect to c, for $r=0$, contains only positive terms. Once that has occurred, it is impossible to continue iteration with $r=0$, since some of the terms in the likelihood equations become infinite, so it is necessary to censor the smallest observation x_1 and any others equal to it (r observations in all). Subsequently, x_1 plays no role in the estimation procedure except as an upper bound on c. Iteration continues until the results of successive steps agree to within some assigned tolerance. If, however, the tolerance has not been met by the time 120 iterations have been performed, the procedure is altered. The Newton-Raphson method is used, starting with the 121st iteration, to estimate the three parameters a, b, and p simultaneously. This is alternated with estimation, by the rule of false position, of the parameter c, which, because it is restricted to the closed interval $[0, x_1]$, does not lend itself to estimation by the Newton-Raphson method, which might yield an estimate outside this interval. The altered procedure is continued until the tolerance has been met or until the total number of iterations reaches 1100, at which point the attempt to estimate the parameters is abandoned. This particular procedure is recommended because the gradient method is the most slowly converging of the three, while the Newton-Raphson method converges most rapidly if the estimates are already quite good, but behaves erratically if they are not, as is likely to be the case at the outset.

4.7. NUMERICAL EXAMPLES

As illustrations, consider the simulated life tests, each on forty components, summarized in Table VII.3. We shall suppose that the "data" represent observed failure times (in hours). Actually, they were obtained by appropriate transformations of uniform, exponential, or normal pseudo-random numbers. For each set of data, the iterative estimation procedure described in subsection 4.6 was carried out for $m=10(10)40$ in the following cases: (1) all four parameters unknown; (2) any three parameters unknown; (3) any two parameters unknown; and (4) any one parameter unknown. The resulting estimates are shown in Table VII.4. The number of iterations required tends to be large when one is estimating b and p simultaneously, especially from censored samples, apparently because of the fact that there is a high negative correlation between $\hat{b}$ and $\hat{p}$, so that their product $\check{d}$, an estimate (not ML) of the shape parameter d, tends to be more stable than either $\hat{b}$ or $\hat{p}$.

The iterative estimation procedure was programmed in FORTRAN and run on the IBM 7094 computer. Machine time tends to be somewhat excessive, averaging about a minute per hundred iterations in cases in which three or four parameters are being estimated.

4.8. CONCLUDING REMARKS

Just how applicable the asymptotic variances and covariances are to estimates from samples of size as small as 40 is an open question. Conceptually, this question might be settled by a Monte Carlo study, but from a practical standpoint any such study large enough to be conclusive would be ruled out by the excessive machine time required. In any case, the estimates given by the iterative procedure described in subsection 4.6, when the location parameter c is unknown, differ in two important respects from those for which asymptotic variances and covariances have been calculated, which assume that at least one observation is censored from below whenever the shape parameter d is less than or equal to 2 and that negative values of the estimate c of the location parameter are permitted. Violation of either of these conditions vitiates the property of asymptotic multivariate normality and changes the asymptotic variances and covariances. Nevertheless, the author believes that, when it converges, the iterative procedure described in subsection 4.6, which violates both of these conditions, results in more realistic estimates. Moreover, the restriction of c to be non-negative results obviously in a reduction (which may be substantial when d is large and n and c/a are small) in the variance of c, and probably, because of the high correlation between the estimators, in a reduction in the other variances and covariances. A comparison of the discrepancies from the true values of the parameters of the estimates given in Table VII.4, for the cases in which $d=3$, with those which one might expect if the asymptotic formulas held tends to confirm that such reductions do occur.

TABLE VII.3 – *Simulated life test data – Hours to failure of ordered random samples of 40 items*

E1 – Exponential Population – $A = 100$, $B = 1$, $P = 1$, $C = 10$ $(D = 1)$

10.15	12.37	12.90	17.39	17.99	22.05	25.17	27.56	32.40	44.84
45.39	46.38	49.52	51.07	56.50	60.52	62.59	68.91	68.93	76.71
81.48	81.84	87.66	89.31	90.90	100.87	101.22	106.35	118.92	122.26
132.71	136.87	137.05	147.96	177.59	193.53	292.49	345.33	351.19	419.97

G2 – Gamma Population – $A = 100$, $B = 2$, $P = 1$, $C = 30$ $(D = 2)$

47	56	58	64	77	79	89	128	131	142
144	149	163	166	175	176	184	184	188	190
191	204	216	227	241	250	256	256	261	273
282	283	286	297	299	338	352	353	357	495

G3 – Gamma Population – $A = 50$, $B = 3$, $P = 1$, $C = 20$ $(D = 3)$

25	54	56	67	69	79	91	102	108	109
113	126	132	134	139	143	153	156	156	166
174	178	181	182	194	198	202	202	217	231
236	246	246	251	263	272	276	343	352	392

W2 – Weibull Population – $A = 100$, $B = 1$, $P = 2$, $C = 10$ $(D = 2)$

15	20	27	42	42	43	44	46	64	65
65	68	68	71	74	75	75	76	77	78
92	95	100	102	102	112	113	116	117	124
124	126	127	134	149	152	153	161	168	205

W3 – Weibull Population – $A = 100$, $B = 1$, $P = 3$, $C = 20$ $(D = 3)$

40.9	52.2	53.2	59.4	60.0	66.8	77.3	78.0	79.7	81.1
81.4	85.4	86.0	86.3	87.4	88.5	89.9	92.4	93.0	93.2
108.7	109.3	111.6	113.1	114.2	117.7	121.6	121.9	127.6	128.0
129.7	130.8	134.1	137.5	139.2	140.3	153.0	153.8	183.3	185.1

HN – Half-Normal Population – $A = 50$, $B = 0.5$, $P = 2$, $C = 20$ $(D = 1)$

20.11	21.77	21.98	23.25	25.06	25.48	25.55	25.59	25.62	25.90
26.19	26.68	30.01	32.44	33.75	33.93	34.07	34.42	35.31	35.84
37.01	37.29	37.57	38.03	40.51	43.23	45.35	47.51	49.27	49.87
51.93	52.21	52.63	54.86	56.06	57.02	60.27	70.66	74.27	86.04

TABLE VII.4 – *Estimates of parameters from first m order statistics of samples in Table VII.3*

	m	$\hat{A}$	$\hat{A}\|B$	$\hat{A}\|P$	$\hat{A}\|C$	$\hat{A}\|B, P$	$\hat{A}\|B, C$	$\hat{A}\|P, C$	$\hat{A}\|B, P, C$	$\hat{B}$	$\hat{B}\|A$	$\hat{B}\|P$	$\hat{B}\|C$
E1	10	*	207.7	303.0	5.19	119.5	238.8	371.4	116.8	*	1.467	0.664	2.970
	20	164.2	101.4	116.8	*	97.4	105.3	132.6	97.2	0.0381	0.997	0.887	*
	30	173.2	88.0	82.8	*	86.9	87.1	93.6	87.1	0.153	0.853	1.046	*
	40	109.2	91.7	98.9	136.4	93.1	90.9	104.1	93.1	0.886	0.931	0.940	0.698
G2	10	*	103.1	548.5	*	119.7	117.0	215.8	112.4	*	2.021	0.790	*
	20	264.6	87.4	68.0	*	98.6	99.1	103.2	99.1	0.0396	1.786	3.203	*
	30	*	113.3	98.6	316.4	95.6	99.6	92.9	96.7	*	2.072	1.930	0.193
	40	302.7	137.2	53.9	279.4	86.3	101.5	72.8	88.8	0.328	2.604	3.851	0.510
G3	10	*	64.1	66.5	*	62.2	39.5	125.7	50.6	*	3.440	2.815	*
	20	*	66.0	57.9	235.4	62.0	42.0	92.5	53.8	*	3.501	3.228	0.0209
	30	240.9	67.1	53.0	248.1	59.4	44.6	75.3	53.6	0.509	3.553	3.432	0.444
	40	221.6	70.0	45.6	233.5	55.7	48.8	60.8	51.8	0.672	3.675	3.844	0.566
W2	10	*	143.2	201.2	*	115.2	136.6	165.6	101.3	*	1.405	0.541	*
	20	*	90.8	75.6	99.3	87.1	83.8	85.8	84.8	*	*	1.443	0.0207
	30	145.9	98.7	107.8	132.1	100.9	96.3	107.3	96.1	0.240	0.954	0.826	0.482
	40	137.8	101.8	94.8	131.5	96.2	92.8	97.7	93.3	0.360	0.952	1.068	0.465
W3	10	*	95.6	133.5	*	91.1	93.4	94.0	92.7	*	0.0152	0.431	*
	20	*	100.6	79.0	*	76.0	81.7	75.6	84.8	*	*	2.020	*
	30	112.1	82.3	101.0	53.7	99.5	95.8	100.6	95.7	0.295	0.568	0.557	2.295
	40	101.0	83.5	99.6	79.2	101.6	95.5	101.7	97.0	0.541	0.560	0.569	1.412
HN	10	*	29.1	7.40	16.4	26.2	17.5	17.7	26.7	*	0.350	15.11	0.0374
	20	30.5	30.7	29.6	*	33.4	32.8	32.9	33.7	0.0350	0.267	0.568	*
	30	7.29	36.3	36.0	33.6	36.2	37.0	37.8	36.4	2.106	0.234	0.504	0.610
	40	30.7	35.7	35.4	36.9	35.7	35.8	36.3	35.8	0.648	0.246	0.510	0.470

TABLE VII.4—*Estimates of parameters from first m order statistics of samples in Table VII.3*—Continued

	m	$\hat{B}\|A,P$	$\hat{B}\|A,C$	$\hat{B}\|P,C$	$\hat{B}\|A,P,C$	$\hat{P}$	$\hat{P}\|A$	$\hat{P}\|B$	$\hat{P}\|C$	$\hat{P}\|A,B$	$\hat{P}\|A,C$	$\hat{P}\|B,C$	$\hat{P}\|A,B,C$
E1	10	1.008	1.514	0.616	0.966	*	0.506	0.692	0.280	0.906	0.459	0.646	0.861
	20	0.956	1.016	0.820	0.936	20.76	0.931	0.923	*	0.927	0.870	0.872	0.886
	30	0.928	0.844	0.942	0.909	5.172	1.211	1.107	*	1.138	1.144	1.001	0.980
	40	0.934	0.917	0.895	0.916	1.056	1.009	0.967	1.184	0.988	0.996	0.947	0.962
G2	10	2.173	2.158	1.363	2.056	*	0.468	0.472	*	0.473	0.696	0.735	0.736
	20	1.931	1.980	1.940	1.980	31.70	0.862	0.857	*	1.003	1.003	0.999	1.004
	30	1.899	1.981	2.072	1.964	*	1.077	1.176	6.781	1.056	1.048	1.049	1.051
	40	1.776	1.988	2.441	1.900	3.329	1.265	1.485	2.856	1.172	1.166	1.179	1.168
G3	10	3.538	2.728	1.665	2.879	*	0.938	1.030	*	0.822	0.700	0.656	0.748
	20	3.611	2.753	1.952	3.020	*	0.954	1.056	70.59	0.867	0.806	0.767	0.857
	30	3.599	2.802	2.206	3.039	3.074	0.985	1.094	3.340	0.911	0.877	0.851	0.911
	40	3.549	2.900	2.555	3.007	2.524	1.036	1.171	2.716	0.964	0.954	0.954	0.968
W2	10	1.084	1.401	0.657	0.931	*	1.002	1.257	*	1.586	1.036	1.372	1.704
	20	0.847	0.0450	0.985	0.852	*	*	2.787	89.88	2.484	41.33	2.091	1.779
	30	0.956	0.931	0.836	0.901	5.017	1.902	1.880	3.108	1.911	1.877	1.780	1.770
	40	0.934	0.863	0.912	0.888	3.626	2.153	2.199	3.242	2.156	2.131	1.945	1.988
W3	10	0.604	0.705	0.980	0.912	*	109.8	1.612	*	1.515	4.098	2.954	2.696
	20	1.305	0.225	1.267	0.831	*	*	5.226	*	5.199	12.57	3.747	2.699
	30	0.567	0.910	0.885	0.894	4.923	2.994	2.143	1.585	2.844	2.901	2.719	2.686
	40	0.565	0.910	0.869	0.894	3.091	3.033	2.330	2.214	2.844	2.880	2.715	2.775
HN	10	0.412	0.334	0.669	0.403	*	2.354	25.70	36.79	1.660	2.410	2.772	1.622
	20	0.409	0.253	0.512	0.402	30.68	3.066	2.240	*	1.666	3.175	2.068	1.632
	30	0.401	0.224	0.475	0.394	0.730	3.467	1.982	1.630	1.671	3.557	1.908	1.639
	40	0.391	0.241	0.486	0.385	1.689	3.282	2.008	2.049	1.799	3.275	1.964	1.765

	m	$\hat{C}$	$\hat{C}\|A$	$\hat{C}\|B$	$\hat{C}\|P$	$\hat{C}\|A,B$	$\hat{C}\|A,P$	$\hat{C}\|B,P$	$\hat{C}\|A,B,P$	$\tilde{D}$**	$\tilde{D}\|A$	$\tilde{D}\|C$	$\tilde{D}\|A,C$
E1	10	*	10.15	10.15	10.15	10.15	9.73	9.34	10.15	*	0.743	0.831	0.695
	20	10.15	10.15	10.15	10.15	10.15	10.15	9.90	10.15	0.791	0.928	*	0.883
	30	10.15	9.62	8.95	9.78	7.81	10.15	10.15	10.15	0.793	1.033	*	0.966
	40	10.15	10.15	10.15	10.15	9.99	10.15	10.01	10.15	0.914	0.939	0.827	0.914
G2	10	*	47.00	47.00	47.00	47.00	23.74	23.83	30.88	*	0.946	*	1.502
	20	40.22	41.52	38.44	0.00	30.08	32.90	30.73	30.17	1.256	1.539	*	1.987
	30	*	25.15	19.40	33.38	28.71	34.04	31.82	30.04	*	2.233	1.312	2.077
	40	46.18	0.00	0.00	0.00	26.56	37.90	35.00	29.53	1.092	3.293	1.455	2.318
G3	10	*	0.47	0.57	4.59	11.67	0.00	2.21	11.84	*	3.227	*	1.910
	20	*	0.00	0.00	0.00	11.66	0.00	2.77	13.08	*	3.341	1.475	2.218
	30	18.01	0.00	0.00	0.00	11.83	0.00	4.92	13.23	1.566	3.500	1.482	2.457
	40	16.07	0.00	0.00	0.00	12.42	0.00	8.19	13.09	1.696	3.808	1.536	2.765
W2	10	*	10.81	12.05	13.94	11.72	3.64	2.87	6.76	*	1.408	*	1.451
	20	*	*	0.00	0.00	0.00	13.22	8.30	4.14	*	*	1.860	1.860
	30	13.94	8.69	7.66	10.33	6.87	7.51	5.45	5.80	1.203	1.814	1.498	1.747
	40	13.20	5.79	2.48	4.79	3.75	7.92	6.79	5.23	1.307	2.049	1.507	1.838
W3	10	*	36.81	37.40	39.43	38.07	35.78	21.04	16.43	*	1.673	*	2.891
	20	*	*	0.00	0.00	0.54	0.00	27.25	11.67	*	*	*	2.823
	30	38.54	36.86	33.12	37.02	16.88	36.86	16.31	15.94	1.452	1.700	3.638	2.641
	40	36.99	36.82	30.80	36.74	16.69	36.78	14.86	16.18	1.673	1.698	3.126	2.622
HN	10	*	20.11	0.00	0.00	20.11	20.11	20.11	20.11	*	0.824	1.376	0.805
	20	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	1.074	0.820	*	0.802
	30	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	1.538	0.811	0.995	0.795
	40	20.11	20.11	20.11	20.11	20.11	20.11	20.11	20.11	1.094	0.806	0.963	0.791

*Iterative estimation procedure did not converge in 1100 iterations—abandoned.

**The estimate $\tilde{D} = \hat{B}\hat{P}$ is the product of the maximum likelihood estimates $\hat{B}$ and $\hat{P}$.

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5. MAXIMUM-LIKELIHOOD ESTIMATION OF TWO PARAMETERS OF LOGISTIC POPULATION*

5.1. INTRODUCTION

The logistic population and the logistic function, which is equal to the cumulative distribution function of the logistic population when certain relations hold between the two sets of parameters, have been applied in studies of population growth by Pearl and Reed (1920), of physicochemical phenomena by Reed and Berkson (1929), of bio-assay by Wilson and Worcester (1943) and by Berkson (1944, 1951, 1957), of mental ability by Birnbaum (1958), of life test data by Plackett (1959), and of biochemical data by Gupta, Qureishi, and Shah (1965).

A great variety of methods have been used to estimate the parameters of the logistic population or, equivalently, those of the logistic function. Pearl and Reed (1920) and Schultz (1930) used a Taylor series expansion to obtain a least squares solution by successive approximations, and Berkson (1944) used a modification of this method. Wilson and Worcester (1943) and Berkson (1957) used the method of maximum likelihood for estimation from complete samples. Plackett (1958) wrote down the likelihood equations for doubly censored samples and used a Taylor series expansion to obtain linearized maximum-likelihood estimators for samples which have been singly censored from above. Berkson and Hodges (1961) found a minimax estimator for the logistic function. Further work on best [or nearly best] linear unbiased estimators has been performed by Kjelsberg (1962) and by Gupta, Qureishi, and Shah (1965). The latter authors have extended, up through sample size $n = 25$, a table of variances and covariances of logistic order statistics computed by Shah (1965) up through $n = 10$ and have used the results to tabulate coefficients, variances, covariances, and relative efficiencies of best linear unbiased estimators from doubly censored samples of size $n = 2(1)25$.

In this section an iterative procedure is given for solving the likelihood equations, which are expressed in somewhat different form than that given by Plackett (1958), for doubly censored samples. The elements of the information matrix are worked out, and this matrix is inverted numerically to obtain the asymptotic variances and covariances of the estimators, which are tabulated in Table F6 for censoring proportions $q_1 = 0.0(0.1)0.4$ from below and $q_2 = q_1(0.1)(0.9 - q_1)$ from above. Results of a Monte Carlo study to obtain information about the small-sample properties of these estimators and to compare them with the best linear unbiased estimators are reported in this section and tabulated in Table G4.

5.2. THE LIKELIHOOD FUNCTION AND ITS DERIVATIVES

The cumulative distribution function of the random variable X having the logistic distribution with location parameter (mean) μ and scale parameter (standard deviation) σ is given by

$$F(x; \mu, \sigma) = \{1 + \exp[-\pi(x - \mu)/\sqrt{3}\sigma]\}^{-1}. \tag{1}$$

The natural logarithm of the likelihood function of a sample of size n from such a distribution, the smallest r_1 and the largest r_2 sample values having been censored, is given by

$$L_{r_1, r_2} = \ln n! - \ln r_1! - \ln r_2! - \sum_{i=r_1+1}^{n-r_2} z_i + 2 \sum_{i=r_1+1}^{n-r_2} \ln F(z_i) + (n - r_1 - r_2) \ln (\pi/\sqrt{3}\sigma) + r_1 \ln F(z_{r_1+1}) + r_2 \ln [1 - F(z_{n-r_2})], \tag{2}$$

where $z_i = \pi(x_i - \mu)/\sqrt{3}\sigma$ and $F(z_i) = [1 + \exp(-z_i)]^{-1}$, so that $f(z_i) = \exp(-z_i)[1 + \exp(-z_i)]^{-2}$ and $f'(z_i) = f(z_i)[2f(z_i)/F(z_i) - 1]$. The first partial derivatives of $L = L_{r_1, r_2}$ with respect to the parameters are given by

*An earlier version of this material was published by Harter and Moore (1967).

$$\partial L/\partial\mu = (\pi/\sqrt{3}\sigma)\{(n-r_1-r_2) - 2\Sigma f(z_i)/F(z_i) - r_1 f(z_{r_1+1})/F(z_{r_1+1}) + r_2 f(z_{n-r_2})/[1-F(z_{n-r_2})]\}, \tag{3}$$

$$\partial L/\partial\sigma = (1/\sigma)\{\Sigma z_i - 2\Sigma z_i f(z_i)/F(z_i) - (n-r_1-r_2) - r_1 z_{r_1+1} f(z_{r_1+1})/F(z_{r_1+1}) + r_2 z_{n-r_2} f(z_{n-r_2})/[1-F(z_{n-r_2})]\}, \tag{4}$$

where the summations are on i running from r_1+1 through $n-r_2$. The second partial derivatives of L with respect to the parameters are given by

$$\partial^2 L/\partial\mu^2 = (\pi^2/3\sigma^2)\{2\Sigma f'(z_i)/F(z_i) - 2\Sigma f^2(z_i)/F^2(z_i) + r_1 f'(z_{r_1+1})/F(z_{r_1+1}) - r_1 f^2(z_{r_1+1})/F^2(z_{r_1+1}) - r_2 f'(z_{n-r_2})/[1-F(z_{n-r_2})] - r_2 f^2(z_{n-r_2})/[1-F(z_{n-r_2})]^2\}, \tag{5}$$

$$\begin{aligned}\partial^2 L/\partial\sigma^2 = (1/\sigma^2)\{&-2\Sigma z_i + 2\Sigma z_i^2 f'(z_i)/F(z_i) + 4\Sigma z_i f(z_i)/F(z_i) - 2\Sigma z_i^2 f^2(z_i)/F^2(z_i) + (n-r_1-r_2)\\ &+ r_1 z_{r_1+1}^2 f'(z_{r_1+1})/F(z_{r_1+1}) + 2r_1 z_{r_1+1} f(z_{r_1+1})/F(z_{r_1+1}) - r_1 z_{r_1+1}^2 f^2(z_{r_1+1})/F^2(z_{r_1+1})\\ &- r_2 z_{n-r_2}^2 f'(z_{n-r_2})/[1-F(z_{n-r_2})] - 2r_2 z_{n-r_2} f(z_{n-r_2})/[1-F(z_{n-r_2})]\\ &- r_2 z_{n-r_2}^2 f^2(z_{n-r_2})/[1-F(z_{n-r_2})]^2\},\end{aligned} \tag{6}$$

$$\begin{aligned}\partial^2 L/\partial\mu\partial\sigma = (\pi/\sqrt{3}\sigma^2)\{&-(n-r_1-r_2) + 2\Sigma z_i f'(z_i)/F(z_i) + 2\Sigma f(z_i)/F(z_i) - 2\Sigma z_i f^2(z_i)/F^2(z_i)\\ &+ r_1 z_{r_1+1} f'(z_{r_1+1})/F(z_{r_1+1}) + r_1 f(z_{r_1+1})/F(z_{r_1+1}) - r_1 z_{r_1+1} f^2(z_{r_1+1})/F^2(z_{r_1+1})\\ &- r_2 z_{n-r_2} f'(z_{n-r_2})/[1-F(z_{n-r_2})] - r_2 f(z_{n-r_2})/[1-F(z_{n-r_2})]\\ &- r_2 z_{n-r_2} f^2(z_{n-r_2})/[1-F(z_{n-r_2})]^2\},\end{aligned} \tag{7}$$

5.3. ASYMPTOTIC VARIANCES AND COVARIANCES

Let $q_1 = r_1/n$, $q_2 = r_2/n$, and $p = 1-q_1-q_2 = (n-r_1-r_2)/n$. As $n\to\infty$ (q_1 and q_2 fixed), $z_{r_1+1}\to\hat{z}_1$, where $F(\hat{z}_1) = \int_{-\infty}^{\hat{z}_1} f(t)dt = q_1$, and $z_{n-r_2}\to\hat{z}_2$, where $1-F(\hat{z}_2) = \int_{\hat{z}_2}^{\infty} f(t)dt = q_2$. Expressing the limits, as $n\to\infty$, of the expected values of the sums in Equations (5)–(7) as integrals between the limits $\hat{z}_1$ and $\hat{z}_2$ and performing the integrations, one obtains the following expressions for the elements of the information matrix (multiplied by σ^2/n):

$$\lim_{n\to\infty}\left(-\frac{\sigma^2}{n}\frac{\partial^2 L}{\partial\mu^2}\right) = \frac{\pi^2}{3}\left\{\left[\frac{2}{3}(1+e^t)^{-3} - (1+e^t)^{-2}\right]_{\hat{z}_1}^{\hat{z}_2} - f'(\hat{z}_1) + f^2(\hat{z}_1)/q_1 + f'(\hat{z}_2) + f^2(\hat{z}_2)/q_2\right\} = v^{11}, \tag{8}$$

$$\begin{aligned}\lim_{n\to\infty}\left(-\frac{\sigma^2}{n}\frac{\partial^2 L}{\partial\sigma^2}\right) = &-p - \frac{1}{3}\left[2t^2e^{-2t}(1+e^{-t})^{-3} - (t^2-4t)e^{-t}(1+e^{-t})^{-2} - 4(1+e^{-t})^{-1}\right]_{\hat{z}_1}^{\hat{z}_2}\\ &+\frac{2}{3}(R_1-R_2) - \frac{1}{3}\left[t^2(1+e^t)^{-1} + 2t\ln(1+e^{-t})\right]_0^{\hat{z}_2} + \frac{1}{3}\left[t^2(1+e^{-t})^{-1} - 2t\ln(1+e^t)\right]_{\hat{z}_1}^0\\ &- \hat{z}_1^2 f'(\hat{z}_1) - 2\hat{z}_1 f(\hat{z}_1) + \hat{z}_1^2 f^2(\hat{z}_1)/q_1 + \hat{z}_2^2 f'(\hat{z}_2) + 2\hat{z}_2 f(\hat{z}_2) + \hat{z}_2^2 f^2(\hat{z}_2)/q_2 = v^{22},\end{aligned} \tag{9}$$

$$\begin{aligned}\lim_{n\to\infty}\left(-\frac{\sigma^2}{n}\frac{\sigma^2 L}{\partial\mu\partial\sigma}\right) = \frac{\pi}{\sqrt{3}}\Big\{&p - \frac{1}{3}\left[2te^{-2t}(1+e^{-t})^{-3} - te^{-t}(1+e^{-t})^{-2} + 2e^{-t}(1+e^{-t})^{-2} + 3(1+e^{-t})^{-1}\right]_{\hat{z}_1}^{\hat{z}_2}\\ &- \frac{1}{3}\left[t(1+e^t)^{-1} + \ln(1+e^{-t})\right]_0^{\hat{z}_2} + \frac{1}{3}\left[t(1+e^{-t})^{-1} - \ln(1+e^t)\right]_{\hat{z}_1}^0\\ &- \hat{z}_1 f'(\hat{z}_1) - f(\hat{z}_1) + \hat{z}_1 f^2(\hat{z}_1)/q_1 + \hat{z}_2 f'(\hat{z}_2) + f(\hat{z}_2) + \hat{z}_2 f^2(\hat{z}_2)/q_2\Big\} = v^{12},\end{aligned} \tag{10}$$

where R_1 and R_2 are definite integrals which, when the integrands are expanded in infinite series, integrated term by term, and evaluated, reduce to

$$R_1 = \begin{cases} [e^t - e^{2t}/2^2 + e^{3t}/3^2 - e^{4t}/4^2 + \ \ldots]_{\hat{z}_1}^{0}, & \hat{z}_1 < 0, \\ 0, & \hat{z}_1 = 0, \\ -[t^2/2 - e^{-t} + e^{-2t}/2^2 - e^{-3t}/3^2 + e^{-4t}/4^2 - \ \ldots]_{0}^{\hat{z}_1}, & \hat{z}_1 > 0, \end{cases}$$

and

$$R_2 = \begin{cases} [e^{-t} - e^{-2t}/2^2 + e^{-3t}/3^2 - e^{-4t}/4^2 + \ \ldots]_{0}^{\hat{z}_2}, & \hat{z}_2 > 0, \\ 0, & \hat{z}_2 = 0, \\ -[t^2/2 - e^{t} + e^{2t}/2^2 - e^{3t}/3^2 + e^{4t}/4^2 - \ \ldots]_{\hat{z}_2}^{0} & \hat{z}_2 < 0. \end{cases}$$

The coefficients of σ^2/n in the asymptotic variances and covariances of $\hat{\mu}$ and $\hat{\sigma}$, which are the elements v_{ij} $(i, j = 1, 2)$ of the matrix $[v_{ij}] = [v^{ij}]^{-1}$, have been computed for $q_1 = 0.0(0.1)0.4$ and $q_2 = q_1(0.1)(0.9 - q_1)$ and are given in Table F6, along with the corresponding results for $\hat{\mu}|\sigma$ and $\hat{\sigma}|\mu$, obtained by inverting submatrices of $[v^{ij}]$ consisting of a single diagonal element. Interchanging q_1 and q_2 leaves the variances and the absolute values of the covariances unchanged, but changes the signs of the covariances.

5.4. ITERATIVE ESTIMATION PROCEDURE

The likelihood equations are obtained by equating to zero the first partial derivatives of the likelihood function, which are given by Equations (3) and (4). The likelihood equations cannot be solved explicitly, but maximum-likelihood estimates can be obtained by solving them iteratively on an electronic computer. The iterative estimation procedure involves estimating the parameters, one at a time, in the cyclic order μ, σ, omitting a parameter if it is assumed to be known. One starts by choosing initial estimate(s) for the unknown parameter(s). At each step, the rule of false position (iterative linear interpolation) is used to determine the value of the parameter then being estimated which satisfies the appropriate likelihood equation, in which the latest estimate (or known value) of the other parameter has been substituted. Iteration continues until the results of successive steps agree to within some assigned tolerance. The author has written a FORTRAN IV program for use on the IBM 7094 computer to estimate, from complete, singly censored, or doubly censored samples, the parameters of a logistic distribution. If one of the parameters is assumed to be known, a single step suffices to estimate the other. Even when both are unknown, experience has shown that the rate of convergence is quite rapid if the initial estimates are reasonable and the amount of censoring is not excessive.

5.5. MONTE CARLO STUDY FOR SMALL SAMPLES

While the maximum-likelihood estimators $\hat{\mu}$ and $\hat{\sigma}$ are asymptotically unbiased and have known asymptotic variances and covariances, they are biased for small samples (except $\hat{\mu}$ when censoring is symmetric), and there is no known analytic method of determining their biases, variances, and covariances for small samples. In order to obtain information about the small-sample properties of these estimators, and incidentally to compare them with the best linear unbiased estimators, a Monte Carlo study was performed on the IBM 7094 computer. For $n = 10$ and for $n = 20$, one thousand pseudo-random samples of size n from a standard logistic distribution ($\mu = 0$, $\sigma = 1$) were generated, and each sample was ordered from smallest to largest. The iterative procedure described in subsection 5.4 was used to compute the estimates $\hat{\mu}$ and $\hat{\sigma}$, also $\hat{\mu}|\sigma$ and $\hat{\sigma}|\mu$, from the m order statistics remaining in each sample after proportions q_1 and q_2 had been censored from below and from above, respectively, where q_1 and q_2 were taken at intervals of 0.1,

subject to the restriction $m \geq 2$. The means, variances, and covariances of the estimates from the 1000 samples of size $n = 10$ are given in Table G4A, and similar results for $n = 20$ are given in Table G4B. The rows of Tables G4A and G4B are *not* statistically independent, since they are based on the same samples (with different proportions censored). The results indicate that $\hat{\sigma}$ and $\hat{\sigma}|\mu$ are negatively biased, while $\hat{\mu}$ and $\hat{\mu}|\sigma$ are negatively biased for $q_1 < q_2$, unbiased for $q_1 = q_2$, and positively biased for $q_1 > q_2$. The absolute value of the bias tends to increase as the amount of censoring increases. The bias of $\hat{\sigma}$ (μ unknown) is approximately equal to $-1/m$, where m is the number of observations remaining after censoring. The bias in estimating either parameter is much smaller when the other parameter is known than when both parameters are estimated simultaneously.

In Tables G4C and G4D the mean square errors of the maximum-likelihood estimates from the 1000 samples of size $n = 10$ and the 1000 samples of size $n = 20$ are compared with the asymptotic variances of the maximum-likelihood estimators and with the variances of the best linear unbiased estimators, which were obtained by rounding four-decimal-place values given by Gupta, Qureishi, and Shah (1965). For censoring symmetric or nearly so, the precision of the two estimators is approximately the same, but for strongly asymmetric censoring the mean square error of the maximum-likelihood estimates is significantly smaller than the variance of the best linear unbiased estimator. The mean square errors of $\hat{\mu}$, $\hat{\mu}|\sigma$, and $\hat{\sigma}$ are only slightly larger than the variances as given by the asymptotic formulas, except in cases of strongly asymmetric censoring. The mean square error of $\hat{\sigma}|\mu$ is often less, and in a few instances [censoring severe but symmetric or almost so] substantially less, than the variance as given by the asymptotic formula.

A rough estimate of the sampling fluctuation can be made by comparing the results when q_1 and q_2 are interchanged, which should theoretically be the same, except for changes in the signs of $M(\hat{\mu})$, $M(\hat{\mu}|\sigma)$, and $C(\hat{\mu}, \hat{\sigma})$ in Tables G4A and G4B.

The reader may find it interesting to compare the results of this Monte Carlo study with those of similar studies for the normal distribution by Harter and Moore (1966) [see subsection 1.5 of this chapter and Table G1] and for the first asymptotic distribution of smallest values by Harter and Moore (1968) [see subsection 6.5 of this chapter and Table G5]. The close agreement between the results for normal and logistic populations is not surprising in view of the fact that it has been shown by Hailey (1952) that, with the proper choice of parameters, the supremum of the absolute difference between the cumulative distribution functions of these two populations is less than one-hundredth.

5.6. NUMERICAL EXAMPLES

Sarhan and Greenberg (1962) have given data resulting from an experiment in which students were learning to measure strontium-90 concentrations in samples of milk. The test substance was supposed to contain 9.22 micromicrocuries per liter. The measurements, each involving readings and calculations, were made, but, since the measurement error was known to be relatively larger at the extremes, especially the upper one, a decision was made to censor the two smallest and the three largest observations, leaving the following censored sample: 8.2, 8.4, 9.1, 9.8, 9.9. Sarhan and Greenberg assumed a normal distribution and proceeded to calculate the best linear unbiased estimates of the mean μ and the standard deviation σ from the doubly censored sample. Gupta, Qureishi, and Shah (1965) assumed a logistic rather than a normal distribution, and again calculated the best linear unbiased estimates of μ and σ. The same data have been used to calculate maximum-likelihood estimates of μ and σ, first assuming a logistic distribution and employing the iterative procedure described in subsection 5.4, then assuming a normal distribution and employing an iterative procedure described by Harter and Moore (1966) [see subsection 1.4 of this chapter]. The results, where μ^* and σ^* are the best linear unbiased estimates previously calculated by the other authors and $\hat{\mu}$ and $\hat{\sigma}$ are the maximum-likelihood estimates, are as follows:

Population Assumed	μ^*	$\hat{\mu}$	σ^*	$\hat{\sigma}$
Logistic	9.3031	9.2718	1.8765	1.5678
Normal	9.2900	9.2606	1.6900	1.3754

Results of the Monte Carlo studies reported in subsection 5.5 for the logistic population and in subsection 1.5 for the normal population indicate that the maximum-likelihood estimates, though negatively biased, would be expected to have slightly smaller mean square errors than the best linear unbiased estimates for the case considered in this example.

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6. MAXIMUM-LIKELIHOOD ESTIMATION OF TWO PARAMETERS OF TYPE I EXTREME-VALUE POPULATION*

6.1. INTRODUCTION

The extreme values in samples from a normal population were studied by von Bortkiewicz (1922 a, b), by Neyman (1923), and by von Mises (1923), who introduced the notion of the characteristic largest value. Dodd (1923) found the asymptotic values of the greatest of n variates in samples from six general types of population. Tippett (1925) obtained mathematical expressions and computed a table for the probability integral of the largest of n observations. Fréchet (1927) obtained an asymptotic distribution of the largest value, and showed that largest values in samples from different populations may have the same asymptotic distribution. Fisher and Tippett (1928) showed that the asymptotic distribution of the largest (or smallest) value in a sample of size n, as $n \to \infty$, for any population satisfying certain regularity conditions, must fall into one of three types.

Gumbel (1935) made an extensive study of the theory of extreme values of statistical distributions. The populations possessing asymptotic distributions of the largest value were classified by von Mises (1936), who also gave sufficient conditions for the validity of the three asymptotic distributions. Gumbel (1937 a, b, 1941) discussed applications of extreme-value theory to such problems as extremes of human age at death, intervals between radioactive emissions, and the return period of floods. In the latter paper he estimated the parameters of an extreme-value distribution by the method of moments. Gnedenko (1943) gave necessary and sufficient conditions for the validity of the three asymptotic distributions of extreme values.

Kimball (1946, 1949) obtained maximum-likelihood estimators of the parameters of a Type I asymptotic distribution of largest values from complete samples. Epstein (1948 a, b) showed how the theory of extreme (smallest) values can be applied in fracture problems, while Epstein and Brooks (1948) considered its implications with regard to the dielectric strength of paper capacitors. Gumbel and Freudenthal (1952) developed the statistical theory of fatigue failures, using the third asymptotic distribution of smallest values, which is identical with the Weibull distribution. Lieblein (1953, 1954) found closed expressions for the variances and covariances of the order statistics of samples from a Type I extreme-value distribution, tabulated them for samples of size $n = 2(1)6$, and used them to obtain best linear unbiased estimators of the parameters from complete samples. Lieblein (1955) extended these results to the case of censored samples.

Kimball (1956) studied the bias of the maximum-likelihood estimators of the parameters of a Type I asymptotic distribution of largest values from complete samples, obtaining an explicit expression for the bias of a modification of the maximum-likelihood estimator of the scale parameter, and compared this estimator with the best linear unbiased estimator for a sample of size $n = 6$. Aziz (1956) and Eldredge (1957), using graphical methods, applied the Type I asymptotic distribution of largest values to studies of corrosion pitting. The latter author asserted that pitting usually follows the Type I distribution, but mentioned cases in which Types II and III would be applicable. Gumbel (1958) gave a comprehensive summary and bibliography of work, much of it his own, on extreme-value theory up to that time.

Epstein (1958) considered stochastic models for length of life, including extreme-value models. Epstein (1960) presented some of the basic elements of extreme-value theory, and gave examples of the application of Types I, II, and III asymptotic distributions of smallest and largest values to a great variety of physical problems. The book on order statistics edited by Sarhan and Greenberg (1962) contains a chapter by Gumbel on the theory of extreme values and sections by Lieblein on the three asymptotic distributions and on order statistics of samples from extreme-value distributions and by Gumbel on an application.

Mann (1963) proposed the use of best linear invariant estimators, which are simple linear functions of the best linear unbiased estimators, for the parameters of a Type I asymptotic distribution of smallest values. Hassanein (1964) proposed the use of nearly best linear unbiased estimators, for which he tabulated co-

*An earlier version of this material was published by Harter and Moore (1968).

efficients of the order statistics from singly and doubly censored samples of size $n = 1(1)10(5)25$. White (1964) extended Lieblein's table of coefficients for best linear unbiased estimators up through $n = 20$ and Mann (1965a) independently extended it up through $n = 25$, both for single censoring from above. Mann (1965b) tabulated factors for calculating Cramér-Rao efficiencies of best linear invariant and best linear unbiased estimators of the parameters from samples of size $n = 2(1)25$ with single censoring from above.

Posner (1965) applied extreme-value theory to error-free communication, estimating the parameters of a Type I asymptotic distribution of largest values from complete samples by the method of maximum likelihood, which he justified on the basis of its asymptotic properties. Gumbel and Mustafi (1966) criticized the use of the method of maximum likelihood, pointing out that asymptotic theory is not necessarily valid for Posner's sample size ($n = 30$) and demonstrating that the modified method of moments gives a better fit to Posner's data, no matter whether one uses the method of least squares or the Kolmogorov-Smirnov statistic as a criterion. They did not, however, offer any proof that the modified method of moments is in general superior to the method of maximum likelihood. Downton (1966) compared the efficiencies of various linear estimators of the parameters of Type I asymptotic distributions of largest and smallest values from complete samples.

Johns and Lieberman (1966) tabulated approximate weights for obtaining best linear invariant estimates from the first m order statistics of samples of size n for $n = 10$, 15, 20, 30, 50, and 100 and four values of m for each n. Weights for these asymptotically optimum linear estimates for other cases of single censoring from above can be calculated from Equations (23) and (24) of the Johns-Lieberman paper; similar expressions for the case of double censoring are easily derived. Mann (1967 a, b) tabulated exact weights for $n = 2(1)25$, $m = 2(1)n$.

Harter and Moore (1967a) [see Chapter V, Section 2 of this volume] found maximum-likelihood estimators, for single censoring from above, of the location parameter of a Type I asymptotic distribution of smallest values with known scale parameter. In the present section, an iterative procedure is given for maximum-likelihood estimation, from singly or doubly censored samples, of both parameters of Type I asymptotic distributions of smallest and largest values. The elements of the information matrix are worked out, and this matrix is inverted numerically to obtain the asymptotic variances and covariances of the estimators, which are tabulated in Table F7 for censoring proportions $q_1 = 0.0(0.1)0.9$ from below and $q_2 = 0.0(0.1)(0.9 - q_1)$ from above. Results are reported of a Monte Carlo study to obtain information about the small-sample properties of these estimators and to compare them with the best linear unbiased and best linear invariant estimators. These results are tabulated in Table G5.

It should be pointed out that if the random variable T has the two-parameter Weibull distribution with scale parameter θ and shape parameter K, then the random variable $X = \ln T$ has the Type I asymptotic distribution of smallest values with location parameter (mode) $u = \ln \theta$ and scale parameter $b = 1/K$. Hence, by suitable transformations, the procedure outlined in this section could be used to estimate the parameters of a Weibull population. However, Harter and Moore (1965) have given a similar iterative procedure for direct estimation of the Weibull parameters [see Section 3 of this chapter].

6.2. THE LIKELIHOOD FUNCTION AND ITS DERIVATIVES

The cumulative distribution function of the random variable X having the first (or Type I) asymptotic distribution of smallest (largest) values with location parameter u and scale parameter b is given by

$$F(x;\, u,\, b) = \begin{cases} 1 - \exp\{-\exp[(x-u)/b]\}, & \text{(smallest values)} \\ \exp\{-\exp[-(x-u)/b]\}, & \text{(largest values)} \end{cases} \tag{1}$$

where $b > 0$. The natural logarithm L_{r_1, r_2} of the likelihood function of a random sample of size n from such a distribution, the lowest r_1 and the highest r_2 sample values having been censored, is given by

$$L_{r_1, r_2} = \ln n! - \ln r_1! - \ln r_2! \pm \sum_{i=r_1+1}^{n-r_2} z_i \sum_{i=r_1+1}^{n-r_2} \exp(\pm z_i)$$
$$- (n - r_1 - r_2) \ln b + r_1 \ln F(z_{r_1+1}) + r_2 \ln [1 - F(z_{n-r_2})], \tag{2}$$

where $z_i=(x_i-u)/b$ and $F(z_i)=\frac{1}{2}\pm\frac{1}{2}\mp\exp[-\exp(\pm z_i)]$, so that $f(z_i)=\exp[\pm z_i-\exp(\pm z_i)]$, the upper (lower) signs being those for the distribution of smallest (largest) values. The first partial derivatives of $L=L_{r_1,r_2}$ with respect to the parameters are given by

$$\partial L/\partial u=\mp(n-r_1-r_2)/b\pm\Sigma\exp(\pm z_i)/b-r_1f(z_{r_1+1})/bF(z_{r_1+1})+r_2f(z_{n-r_2})/b[1-F(z_{n-r_2})], \tag{3}$$

$$\partial L/\partial b=\mp\Sigma z_i/b\pm\Sigma z_i\exp(\pm z_i)/b-(n-r_1-r_2)/b-r_1z_{r_1+1}f(z_{r_1+1})/bF(z_{r_1+1})+r_2z_{n-r_2}f(z_{n-r_2})/b[1-F(z_{n-r_2})], \tag{4}$$

where the summations are on i running from r_1+1 through $n-r_2$. The second partial derivatives of L with respect to the parameters are given by

$$\partial^2L/\partial u^2=-\Sigma\exp(\pm z_i)/b^2+r_1\{[\pm1\mp\exp(\pm z_{r_1+1})]f(z_{r_1+1})F(z_{r_1+1})-f^2(z_{r_1+1})\}/b^2F^2(z_{r_1+1})-r_2\{[\pm1\mp\exp(\pm z_{n-r_2})]f(z_{n-r_2})[1-F(z_{n-r_2})]+f^2(z_{n-r_2})\}/b^2[1-F(z_{n-r_2})]^2, \tag{5}$$

$$\partial^2L/\partial b^2=\pm2\Sigma z_i/b^2-\Sigma z_i^2\exp(\pm z_i)/b^2\mp2\Sigma z_i\exp(\pm z_i)/b^2+(n-r_1-r_2)/b^2+r_1\{2z_{r_1+1}f(z_{r_1+1})F(z_{r_1+1})+z_{r_1+1}^2[\pm1\mp\exp(\pm z_{r_1+1})]f(z_{r_1+1})F(z_{r_1+1})-z_{r_1+1}^2f^2(z_{r_1+1})\}/b^2F(z_{r_1+1})-r_2\{2z_{n-r_2}f(z_{n-r_2})[1-F(z_{n-r_2})]+z_{n-r_2}^2[\pm1\mp\exp(\pm z_{n-r_2})]f(z_{n-r_2})[1-F(z_{n-r_2})]+z_{n-r_2}^2f^2(z_{n-r_2})\}/b^2[1-F(z_{n-r_2})]^2, \tag{6}$$

$$\partial^2L/\partial u\partial b=\pm(n-r_1-r_2)/b^2-\Sigma z_i\exp(\pm z_i)/b^2\mp\exp(\pm z_i)/b^2+r_1\{f(z_{r_1+1})F(z_{r_1+1})+z_{r_1+1}[\pm1\mp\exp(\pm z_{r_1+1})]f(z_{r_1+1})F(z_{r_1+1})-z_{r_1+1}f^2(z_{r_1+1})\}/b^2F^2(z_{r_1+1})-r_2\{f(z_{n-r_2})[1-F(z_{n-r_2})]+z_{n-r_2}[\pm1\mp\exp(\pm z_{n-r_2})]f(z_{n-r_2})[1-F(z_{n-r_2})]+z_{n-r_2}f^2(z_{n-r_2})\}/b^2[1-F(z_{n-r_2})]^2. \tag{7}$$

6.3. ASYMPTOTIC VARIANCES AND COVARIANCES

Let $q_1=r_1/n$, $q_2=r_2/n$, and $p=1-q_1-q_2=(n-r_1-r_2)/n$. As $n\to\infty$ (q_1 and q_2 fixed), $z_{r_1+1}\to\hat{z}_1$ where $F(\hat{z}_1)=\int_{-\infty}^{\hat{z}_1}f(t)dt=q_1$ and $z_{n-r_2}\to\hat{z}_2$ where $1-F(\hat{z}_2)=\int_{\hat{z}_2}^{\infty}f(t)dt=q_2$. For the distribution of smallest values,

$$E(\Sigma z_i)\to n\int_{\hat{z}_1}^{\hat{z}_2}tf(t)dt=n[\Gamma'(1;\exp\hat{z}_2)-\Gamma'(1;\exp\hat{z}_1)], \tag{8}$$

$$E(\Sigma\exp z_i)\to n\int_{\hat{z}_1}^{\hat{z}_2}\exp tf(t)dt=n[\Gamma(2;\exp\hat{z}_2)-\Gamma(2;\exp\hat{z}_1)], \tag{9}$$

$$E(\Sigma z_i\exp z_i)\to n\int_{\hat{z}_1}^{\hat{z}_2}t\exp tf(t)dt=n[\Gamma'(2;\exp\hat{z}_2)-\Gamma'(2;\exp\hat{z}_1)], \tag{10}$$

$$E(\Sigma z_i^2\exp z_i)\to n\int_{\hat{z}_1}^{\hat{z}_2}t^2\exp tf(t)dt=n[\Gamma''(2;\exp\hat{z}_2)-\Gamma''(2;\exp\hat{z}_1)], \tag{11}$$

where $\Gamma(y;w)=\int_0^w t^{y-1}e^{-t}dt$ is the incomplete Gamma function, $\Gamma'(a;w)=(d/dy)[\Gamma(y;w)]\,|_{y=a}$ and $\Gamma''(a;w)$ is analogously defined. The elements of the information matrix (multiplied by b^2/n) may, after simplification, which involves use of the relations $\Gamma(2;w)=1-(1+w)\exp(-w)$, $\exp\hat{z}_1=-\ln(1-q_1)$ and $\exp\hat{z}_2=-\ln q_2$, be written as

$$\lim_{n\to\infty}(-b^2/n)E(\partial^2L/\partial u^2)=p+q_2\ln q_2+(1-q_1)\ln(1-q_1)=v^{11}, \tag{12}$$

$$\lim_{n\to\infty}(-b^2/n)E(\partial^2 L/\partial b^2) = -p - 2\{\Gamma'(1;-\ln q_2) - \Gamma'[1;-\ln(1-q_1)]\} - \Gamma''(2;-\ln q_2)$$

$$-\Gamma''[2;-\ln(1-q_1)] + 2\{\Gamma'(2;-\ln q_2) - \Gamma'[2;-\ln(1-q_1)]\} - q_2 \ln q_2 \ln(-\ln q_2)[2+\ln(-\ln q_2)]$$

$$+(1-q_1)\ln(1-q_1)\ln[-\ln(1-q_1)]\{2+\ln[-\ln(1-q_1)]+\ln(1-q_1)\ln[-\ln(1-q_1)]/q_1\} = v^{22}, \qquad (13)$$

$$\lim_{n\to\infty}(-b^2/n)E(\partial^2 L/\partial u\partial b) = \Gamma'(2;-\ln q_2) - \Gamma'[2;-\ln(1-q_1)] - q_2 \ln q_2 \ln(-\ln q_2)$$

$$+(1-q_1)\ln(1-q_1)\ln[-\ln(1-q_1)] + (q_1^{-1}-1)\ln^2(1-q_1)\ln[-\ln(1-q_1)] = v^{12}. \qquad (14)$$

The asymptotic variance-covariance matrix for the estimators $\hat{u}$ and $\hat{b}$ is then $(b^2/n)[v_{ij}]$, where $[v_{ij}] = [v^{ij}]^{-1}$. The coefficients of b^2/n in the asymptotic variances and covariances are given in Table F7 for $q_1 = 0.0(0.1)0.9$ and $q_2 = 0.0(0.1)(0.9 - q_1)$.

It can be shown that if one considers the distribution of largest values instead of the distribution of smallest values, and at the same time interchanges the values of q_1 and q_2, the values of v^{11}, v^{22}, v_{11} and v_{22} remain the same, while v^{12} and v_{12} retain the same absolute values but reverse their signs.

6.4. ITERATIVE ESTIMATION PROCEDURE

The likelihood equations are obtained by equating to zero the first partial derivatives of the likelihood function, which are given by Equations (3) and (4). The likelihood equations cannot be solved explicitly, but maximum-likelihood estimates can be obtained by solving them iteratively on an electronic computer. The iterative estimation procedure involves estimating the parameters, one at a time, in the cyclic order u, b, omitting a parameter if it is assumed to be known. One starts by choosing initial estimate(s) for the unknown parameter(s). At each step, the rule of false position (iterative linear interpolation) is used to determine the value of the parameter then being estimated which satisfies the appropriate likelihood equation, in which the latest estimate (or known value) of the other parameter has been substituted. Iteration continues until the results of successive steps agree to within some assigned tolerance. The author has written a FORTRAN IV program for use on the IBM 7094 computer to estimate, from complete, singly censored, or doubly censored samples, the parameters of a Type I asymptotic distribution of smallest (largest) values. The same program is made to work for both by including an IF statement, based on a dummy variable which is set equal to 0(1) for the distribution of smallest (largest) values, to control the signs of terms which differ for the two cases. If one of the parameters is assumed to be known, a single iteration suffices to estimate the other. Even when both are unknown, experience has shown that the rate of convergence is quite rapid if the initial estimates are reasonable and the amount of censoring is not excessive.

6.5. MONTE CARLO STUDY FOR SMALL SAMPLES

While the maximum-likelihood estimators $\hat{u}$ and $\hat{b}$ are asymptotically unbiased and have known asymptotic variances and covariances, there is no known analytic method of determining their biases, variances, and covariances for small samples. In order to obtain information about the small-sample properties of these estimators, and incidentally to compare them with the best linear unbiased and best linear invariant estimators, a Monte Carlo study was performed on the IBM 7094 computer. For $n = 10$ and for $n = 20$, two thousand pseudo-random samples of size n from a standard Type I asymptotic distribution of smallest values ($u = 0$, $b = 1$) were generated, and each sample was ordered from smallest to largest. The iterative procedure described in subsection 6.4 was used to compute the estimates $\hat{u}$ and $\hat{b}$, also $\hat{u} \mid b$ and $\hat{b} \mid u$, from the m order statistics remaining in each sample after proportions q_1 and q_2 had been censored from below and from above, respectively, where q_1 and q_2 were taken at intervals of 0.1, subject to the restriction $m \geq 2$. The means, variances, and covariances of the estimates from 2000 samples of size $n = 10$ are given in Table G5A, and similar results for $n = 20$ are given in Table G5B. The rows of Table G5A (and likewise Table G5B) are not statistically independent, since they are based on the same samples (with different proportions censored). The results indicate that $\hat{u}$, $\hat{b}$, $\hat{u} \mid b$, and $\hat{b} \mid u$ are all negatively biased, except that $\hat{u}$ is positively biased when q_1 is much larger than q_2. The absolute value of the bias tends to increase as the amount of censoring increases. The bias of $\hat{b}$ (u unknown) is approximately equal to $-1/m$. The bias in estimating either parameter is much smaller when the other parameter is known than when both parameters are estimated simultaneously.

In Tables G5C and G5D, the mean square errors of the maximum-likelihood estimates from the 2000 samples of sizes $n = 10$ and $n = 20$, respectively, are compared with the asymptotic variances of the maximum-likelihood estimators. In cases of single censoring from above, they are also compared with the variances of the best linear unbiased estimators and the mean square errors of the best linear invariant estimators, which were obtained by rounding six-decimal-place values given by Mann (1965b). For little or no censoring, the precision of all three estimators is approximately the same, but for severe censoring from above the mean square errors of the best linear invariant estimator and of the maximum-likelihood estimate are significantly smaller than the variance of the best linear unbiased estimator, while differing so little from each other that the difference may well be due to sampling fluctuation. The mean square errors of $\hat{u}$, $\hat{u} \mid b$, and $\hat{b}$ are only slightly larger than the variances as given by the asymptotic formulas, except in cases of severe censoring. The mean square error of $\hat{b} \mid u$ is often less, and in a few instances [censoring severe but symmetric or almost so] substantially less, than the variance as given by the asymptotic formula.

Since the mean square errors of the maximum-likelihood estimators have been shown to differ but little from those of the best linear invariant estimators and to be considerably smaller than those of the best linear unbiased estimators in some cases, especially those involving strongly asymmetric censoring, the use of the maximum-likelihood estimators has much to recommend it to anyone who has access to an electronic computer. Listings and/or program decks for the iterative procedure proposed in this section and those for other populations proposed elsewhere in this chapter are available from the author on request.

The reader may find it interesting to compare the results of this Monte Carlo study with those of similar studies for the normal distribution by Harter and Moore (1966) [see subsection 1.5 of this chapter and Table G1] and for the logistic distribution by Harter and Moore (1967b) [see subsection 5.5 of this chapter and Table G4.]

6.6. NUMERICAL EXAMPLE

Consider the following sample of size 40 from a Type I asymptotic distribution of smallest values whose parameters we wish to estimate:

1.609	3.466	3.989	4.060	4.174	4.407	4.522	4.673	4.762	4.963
2.303	3.497	4.007	4.111	4.190	4.443	4.625	4.736	4.820	5.017
2.833	3.526	4.007	4.159	4.205	4.500	4.635	4.736	4.934	5.063
3.466	3.584	4.060	4.174	4.220	4.522	4.663	4.754	4.956	5.273

Suppose that for some reason we decide to censor the first 4 and the last 4 observations. If we apply the procedure outlined in subsection 6.4, starting from initial estimates $\hat{u}_0 = 4.5$ and $\hat{b}_0 = 0.6$, the estimates converge after four iterations to $\hat{u} = 4.5509$ and $\hat{b} = 0.5024$. The results are not dependent on the intitial estimates, but good initial estimates tend to decrease the number of iterations.

Since there is evidence [see Johns and Lieberman (1964)] that asymptotic theory gives a good approximation to the distribution of estimates for samples of size 40, not too severely censored, we may use the asymptotic variances given in Table F7 to obtain approximate confidence bounds on the true values of the parameters. Since b is unknown, we approximate it by $\hat{b} = 0.5024$, and find $\hat{\sigma}_u \doteq 0.5024\ \sqrt{1.157024/40} = 0.0855$ and $\hat{\sigma}_b \doteq 0.5024\ \sqrt{0.842250/40} = 0.0729$. Hence approximate 90 percent confidence bounds on u are $4.5509 - 1.645(0.0855) = 4.4103$ and $4.5509 + 1.645(0.0855) = 4.6915$, while approximate 90 percent confidence bounds on b are $0.5024 - 1.645(0.0729) = 0.3825$ and $0.5024 + 1.645(0.0729) = 0.6223$. Actually, the data are the natural logarithms of a pseudo-random sample from a two-parameter Weibull distribution with scale parameter 100 and shape parameter 2. Hence the true parameter values are $u = \ln 100 = 4.6052$ and $b = 1/2 = 0.5$, which are included in the approximate 90 percent confidence intervals.

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7. REMARKS ON INTERVAL ESTIMATION OF PARAMETERS OF ABOVE POPULATIONS

7.1. CONFIDENCE BOUNDS FOR INDIVIDUAL PARAMETERS

If estimation is regular, so that the maximum-likelihood estimator of a single parameter is asymptotically normally distributed, and if the sample size is large enough so that the asymptotic theory is valid, the asymptotic variances tabulated in Appendix F for various populations can be used to obtain confidence bounds for individual parameters. A numerical example for a Type I asymptotic distribution of smallest values has already been given in subsection 6.6 of this chapter. The same procedure could be used for normal, two-parameter lognormal, two-parameter Weibull, two-parameter Gamma, and logistic populations, for which estimation is regular and Monte Carlo studies for small to moderate samples have shown results in close agreement with asymptotic theory. When one of the parameters being estimated is a location parameter of the threshold type, as in the case of three-parameter lognormal, three-parameter Weibull, three-parameter Gamma, and four-parameter generalized Gamma populations, estimation is non-regular except when certain restrictive conditions are satisfied, and even under these conditions Monte Carlo studies have shown that asymptotic theory is valid only for extremely large samples, so this procedure is not recommended for these populations. Even for three-parameter generalized Gamma populations, it should be used with caution.

The asymptotic variances tabulated in Appendix F depend, in most cases, on a power of the scale parameter; in some cases, they also depend, in a more complicated way, on the values of one or more other parameters. If the values of the parameters on which they depend are known, these values can be used, along with the tabulated asymptotic variances, to obtain confidence bounds on each of the other parameters which are "exact" in the sense that the only approximation involved is that implicit in the assumption that asymptotic theory is valid for samples of the size under consideration. Otherwise, the best that one can do is to substitute sample estimates for unknown population parameters and proceed to obtain approximate confidence bounds, as we have done in the example of subsection 6.6.

7.2. CONFIDENCE ELLIPSOIDS FOR SETS OF PARAMETERS

Let p be the number of unknown parameters of the population under consideration. Let V $(p \times p)$ be the asymptotic variance-covariance matrix, and let the maximum-likelihood estimators of the parameters be represented by the p components of the vector Y. Then, if estimation is regular, the asymptotic joint distribution of the estimators is p-variate normal and is given by

$$f(Y) = \exp\ (-\tfrac{1}{2}Y'V^{-1}Y)\ /(2\pi)^{p/2}|V|^{1/2}. \tag{1}$$

If the sample size is large enough so that asymptotic theory is valid, we can use Equation (1), together with the tabulated asymptotic variances and covariances, to obtain p-dimensional confidence ellipsoids for the set of p parameters.

Appendix A

TABLES BASED ON QUASI-RANGES OF SAMPLES FROM A NORMAL POPULATION

SOURCES OF TABLES

Tables A1–A5 WADC TR 58–200 (Harter)
Tables A6–A9 ARL 31, Part II (Harter)

Table A1

EXPECTED VALUES OF QUASI-RANGES

Expected Value of the rth Quasi-Range for Samples of n from N(0, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
2	1.128379								
3	1.692569								
4	2.058751	0.594023							
5	2.325929	0.990038							
6	2.534413	1.283510	0.403094						
7	2.704357	1.514749	0.705414						
8	2.847201	1.704450	0.945645	0.305029					
9	2.970026	1.864595	1.143942	0.549052					
10	3.077505	2.002714	1.312118	0.751529	0.245336				
11	3.172873	2.123833	1.457679	0.923957	0.449782				
12	3.258455	2.231464	1.585676	1.073686	0.624498	0.205179			
13	3.335980	2.328154	1.699669	1.205700	0.776654	0.381047			
14	3.406763	2.415805	1.802253	1.323527	0.911132	0.534594	0.176318		
15	3.471827	2.495870	1.895378	1.429755	1.031402	0.670592	0.330597		
16	3.531983	2.569488	1.980542	1.526333	1.140019	0.792446	0.467503	0.154575	
17	3.587884	2.637564	2.058922	1.614770	1.238915	0.902667	0.590373	0.291975	
18	3.640064	2.700827	2.131456	1.696250	1.329589	1.003163	0.701674	0.415471	0.137605
19	3.688963	2.759877	2.198906	1.771724	1.413223	1.095415	0.803285	0.527486	0.261450
20	3.734950	2.815208	2.261896	1.841963	1.490766	1.180594	0.896664	0.629866	0.373915
21	3.778336	2.867236	2.320945	1.907604	1.562992	1.259644	0.982970	0.724051	0.476816
22	3.819385	2.916311	2.376488	1.969174	1.630538	1.333334	1.063136	0.811183	0.571570
23	3.858323	2.962731	2.428893	2.027118	1.693938	1.402301	1.137928	0.892185	0.659305
24	3.895348	3.006755	2.478476	2.081814	1.753638	1.467076	1.207975	0.967812	0.740931
25	3.930629	3.048602	2.525506	2.133585	1.810021	1.528108	1.273807	1.038691	0.817195

Expected Value of the rth Quasi-Range for Samples of n from N(0, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
26	3.964316	3.088468	2.570219	2.182707	1.863411	1.585779	1.335872	1.105347	0.888717
27	3.996539	3.126520	2.612819	2.229423	1.914092	1.640416	1.394549	1.168222	0.956017
28	4.027414	3.162907	2.653484	2.273942	1.962307	1.692302	1.450167	1.227697	1.019535
29	4.057044	3.197761	2.692372	2.316449	2.008271	1.741683	1.503007	1.284097	1.079647
30	4.085522	3.231200	2.729624	2.357108	2.052170	1.788775	1.553316	1.337704	1.136678
31	4.112928	3.263326	2.765363	2.396061	2.094171	1.833766	1.601311	1.388764	1.190907
32	4.139338	3.294235	2.799700	2.433439	2.134420	1.876825	1.647180	1.437492	1.242580
33	4.164817	3.324009	2.832734	2.469355	2.173049	1.918099	1.691092	1.484078	1.291910
34	4.189425	3.352725	2.864556	2.503912	2.210174	1.957721	1.733196	1.528690	1.339088
35	4.213219	3.380451	2.895245	2.537204	2.245901	1.995809	1.773626	1.571478	1.384281
36	4.236247	3.407249	2.924875	2.569314	2.280326	2.032471	1.812500	1.612575	1.427639
37	4.258554	3.433177	2.953513	2.600317	2.313532	2.067802	1.849927	1.652101	1.469294
38	4.280183	3.458286	2.981218	2.630284	2.345600	2.101890	1.886002	1.690164	1.509367
39	4.301171	3.482623	3.008047	2.659277	2.376598	2.134813	1.920814	1.726860	1.547965
40	4.321554	3.506233	3.034049	2.687353	2.406591	2.166643	1.954443	1.762279	1.585186
41	4.341364	3.529154	3.059272	2.714565	2.435639	2.197445	1.986961	1.796500	1.621118
42	4.360631	3.551424	3.083756	2.740962	2.463796	2.227280	2.018434	1.829596	1.655842
43	4.379382	3.573076	3.107544	2.766588	2.491111	2.256203	2.048923	1.861634	1.689430
44	4.397644	3.594143	3.130670	2.791484	2.517629	2.284264	2.078483	1.892675	1.721950
45	4.415439	3.614654	3.153169	2.815688	2.543394	2.311510	2.107166	1.922775	1.753463
46	4.432790	3.634635	3.175071	2.839235	2.568444	2.337984	2.135019	1.951985	1.784025
47	4.449718	3.654111	3.196406	2.862158	2.592816	2.363725	2.162086	1.980354	1.813688
48	4.466242	3.673108	3.217201	2.884486	2.616542	2.388771	2.188406	2.007924	1.842500
49	4.482379	3.691645	3.237481	2.906249	2.639654	2.413155	2.214017	2.034738	1.870505
50	4.498147	3.709744	3.257268	2.927472	2.662181	2.436910	2.238954	2.060832	1.897744

Expected Value of the rth Quasi-Range for Samples of n from N(0, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
51	4.513562	3.727424	3.276586	2.948181	2.684150	2.460065	2.263249	2.086242	1.924256
52	4.528637	3.744702	3.295455	2.968397	2.705587	2.482647	2.286933	2.110999	1.950074
53	4.543388	3.761597	3.313894	2.988142	2.726514	2.504683	2.310032	2.135136	1.975233
54	4.557827	3.778123	3.331921	3.007438	2.746955	2.526197	2.332574	2.158679	1.999762
55	4.571967	3.794295	3.349553	3.026301	2.766929	2.547210	2.354583	2.181655	2.023691
56	4.585818	3.810128	3.366805	3.044750	2.786457	2.567746	2.376082	2.204090	2.047045
57	4.599393	3.825635	3.383695	3.062803	2.805556	2.587823	2.397093	2.226007	2.069851
58	4.612701	3.840828	3.400234	3.080474	2.824244	2.607460	2.417635	2.247427	2.092132
59	4.625752	3.855719	3.416437	3.097778	2.842538	2.626675	2.437728	2.268371	2.113909
60	4.638556	3.870319	3.432316	3.114730	2.860452	2.645484	2.457390	2.288858	2.135204
61	4.651122	3.884639	3.447884	3.131343	2.878001	2.663904	2.476638	2.308906	2.156036
62	4.663457	3.898688	3.463151	3.147629	2.895199	2.681948	2.495488	2.328534	2.176423
63	4.675569	3.912477	3.478128	3.163599	2.912058	2.699632	2.513954	2.347756	2.196382
64	4.687467	3.926014	3.492827	3.179267	2.928591	2.716968	2.532052	2.366588	2.215931
65	4.699157	3.939308	3.507255	3.194641	2.944809	2.733968	2.549794	2.385044	2.235084
66	4.710646	3.952367	3.521423	3.209732	2.960724	2.750646	2.567194	2.403139	2.253856
67	4.721941	3.965199	3.535339	3.224550	2.976347	2.767011	2.584263	2.420886	2.272261
68	4.733047	3.977811	3.549011	3.239104	2.991685	2.783075	2.601013	2.438295	2.290312
69	4.743971	3.990210	3.562448	3.253403	3.006751	2.798849	2.617456	2.455380	2.308021
70	4.754718	4.002402	3.575656	3.267455	3.021552	2.814341	2.633601	2.472152	2.325401
71	4.765294	4.014395	3.588644	3.281267	3.036096	2.829561	2.649458	2.488620	2.342462
72	4.775704	4.026195	3.601418	3.294848	3.050393	2.844517	2.665037	2.504796	2.359216
73	4.785953	4.037806	3.613984	3.308204	3.064450	2.859219	2.680347	2.520688	2.375673
74	4.796045	4.049236	3.626349	3.321343	3.078275	2.873674	2.695396	2.536305	2.391841
75	4.805985	4.060488	3.638519	3.334271	3.091874	2.887890	2.710192	2.551658	2.407731

Expected Value of the rth Quasi-Range for Samples of n from N(0, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
76	4.815777	4.071569	3.650499	3.346994	3.105254	2.901874	2.724744	2.566752	2.423351
77	4.825426	4.082483	3.662296	3.359519	3.118422	2.915633	2.739059	2.581598	2.438709
78	4.834935	4.093235	3.673914	3.371850	3.131384	2.929174	2.753143	2.596201	2.453815
79	4.844308	4.103829	3.685358	3.383994	3.144146	2.942503	2.767004	2.610571	2.468674
80	4.853549	4.114270	3.696633	3.395957	3.156714	2.955626	2.780649	2.624712	2.483296
81	4.862661	4.124561	3.707745	3.407742	3.169094	2.968550	2.794083	2.638633	2.497686
82	4.871648	4.134708	3.718696	3.419355	3.181289	2.981279	2.807312	2.652339	2.511851
83	4.880513	4.144713	3.729492	3.430800	3.193307	2.993819	2.820343	2.665836	2.525799
84	4.889259	4.154581	3.740137	3.442082	3.205150	3.006176	2.833180	2.679131	2.539534
85	4.897890	4.164315	3.750635	3.453206	3.216825	3.018355	2.845830	2.692229	2.553063
86	4.906407	4.173918	3.760988	3.464176	3.228335	3.030359	2.858296	2.705135	2.566393
87	4.914814	4.183393	3.771203	3.474994	3.239685	3.042194	2.870585	2.717855	2.579527
88	4.923114	4.192745	3.781280	3.485666	3.250879	3.053864	2.882700	2.730393	2.592471
89	4.931308	4.201975	3.791225	3.496196	3.261921	3.065374	2.894647	2.742754	2.605232
90	4.939401	4.211087	3.801040	3.506585	3.272815	3.076727	2.906429	2.754944	2.617812
91	4.947393	4.220084	3.810729	3.516839	3.283565	3.087928	2.918051	2.766965	2.630218
92	4.955288	4.228968	3.820294	3.526960	3.294173	3.098980	2.929517	2.778824	2.642452
93	4.963087	4.237743	3.829739	3.536952	3.304644	3.109887	2.940830	2.790523	2.654521
94	4.970794	4.246410	3.839066	3.546818	3.314980	3.120652	2.951995	2.802066	2.666428
95	4.978409	4.254972	3.848278	3.556560	3.325186	3.131279	2.963015	2.813458	2.678176
96	4.985935	4.263431	3.857378	3.566181	3.335264	3.141772	2.973894	2.824702	2.689771
97	4.993374	4.271790	3.866368	3.575685	3.345216	3.152132	2.984634	2.835802	2.701215
98	5.000728	4.280051	3.875251	3.585074	3.355047	3.162364	2.995240	2.846761	2.712512
99	5.007998	4.288217	3.884029	3.594350	3.364759	3.172471	3.005713	2.857582	2.723666
100	5.015187	4.296289	3.892705	3.603517	3.374354	3.182455	3.016059	2.868269	2.734680

Table A2

VARIANCES OF QUASI-RANGES

Variance of the rth Quasi-Range for Samples of n from $N(\mu, 1)$

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
2	.72676								
3	.78920								
4	.77406	.24902							
5	.74664	.32315							
6	.71917	.34734	.12588						
7	.69423	.35350	.18023						
8	.67212	.35231	.20590	.07602					
9	.65259	.34796	.21829	.11578					
10	.63529	.34231	.22394	.13799	.05091				
11	.61986	.33619	.22594	.15081	.08089				
12	.60603	.33003	.22589	.15830	.09943	.03649			
13	.59354	.32402	.22466	.16256	.11125	.05980			
14	.58220	.31827	.22275	.16481	.11892	.07525	.02744		
15	.57185	.31280	.22045	.16576	.12391	.08577	.04604		
16	.56235	.30763	.21796	.16588	.12713	.09305	.05902	.02138	
17	.55361	.30275	.21537	.16544	.12913	.09814	.06828	.03655	
18	.54551	.29816	.21277	.16462	.13028	.10171	.07499	.04757	.01714
19	.53799	.29382	.21019	.16356	.13084	.10419	.07991	.05572	.02973
20	.53098	.28973	.20765	.16234	.13097	.10588	.08353	.06183	.03918
21	.52442	.28586	.20518	.16101	.13079	.10700	.08620	.06646	.04637
22	.51827	.28220	.20279	.15963	.13040	.10768	.08817	.07000	.05191
23	.51249	.27874	.20048	.15822	.12984	.10805	.08959	.07271	.05622
24	.50703	.27545	.19825	.15679	.12917	.10817	.09061	.07478	.05960
25	.50188	.27233	.19611	.15537	.12841	.10810	.09131	.07637	.06226
26	.49699	.26936	.19404	.15396	.12760	.10789	.09175	.07757	.06436
27	.49236	.26653	.19205	.15258	.12675	.10757	.09201	.07848	.06602
28	.48796	.26383	.19014	.15122	.12587	.10717	.09211	.07914	.06733
29	.48377	.26126	.18830	.14989	.12498	.10671	.09209	.07961	.06836
30	.47977	.25879	.18652	.14859	.12409	.10619	.09198	.07992	.06916
31	.47595	.25644	.18481	.14732	.12319	.10565	.09178	.08011	.06977
32	.47229	.25417	.18316	.14609	.12230	.10507	.09153	.08020	.07023
33	.46879	.25201	.18158	.14489	.12141	.10448	.09123	.08020	.07056
34	.46544	.24992	.18004	.14372	.12054	.10388	.09089	.08014	.07079
35	.46221	.24792	.17857	.14259	.11969	.10327	.09052	.08002	.07094

Variance of the rth Quasi-Range for Samples of n from N(μ, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
36	.45910	.24599	.17714	.14148	.11884	.10265	.09013	.07985	.07101
37	.45612	.24413	.17576	.14042	.11801	.10204	.08972	.07965	.07103
38	.45325	.24234	.17443	.13937	.11719	.10142	.08930	.07941	.07099
39	.45048	.24062	.17313	.13836	.11640	.10081	.08886	.07916	.07091
40	.44780	.23894	.17188	.13738	.11562	.10021	.08842	.07888	.07080
41	.44521	.23733	.17067	.13642	.11486	.09961	.08797	.07858	.07066
42	.44271	.23577	.16950	.13549	.11411	.09902	.08753	.07827	.07049
43	.44029	.23426	.16837	.13458	.11337	.09844	.08708	.07796	.07031
44	.43794	.23280	.16726	.13370	.11266	.09786	.08663	.07763	.07010
45	.43567	.23137	.16619	.13284	.11196	.09730	.08619	.07730	.06988
46	.43347	.23000	.16515	.13201	.11128	.09674	.08574	.07696	.06965
47	.43133	.22867	.16414	.13119	.11061	.09619	.08530	.07662	.06942
48	.42925	.22736	.16316	.13040	.10996	.09565	.08486	.07629	.06917
49	.42724	.22611	.16220	.12963	.10932	.09512	.08443	.07594	.06892
50	.42527	.22488	.16127	.12888	.10869	.09460	.08401	.07560	.06866
51	.42336	.22369	.16036	.12814	.10808	.09409	.08359	.07526	.06840
52	.42151	.22253	.15948	.12742	.10748	.09359	.08317	.07492	.06813
53	.41970	.22140	.15862	.12673	.10690	.09310	.08276	.07458	.06787
54	.41794	.22030	.15778	.12604	.10633	.09262	.08235	.07425	.06760
55	.41621	.21923	.15696	.12537	.10577	.09215	.08195	.07392	.06733
56	.41454	.21819	.15616	.12473	.10522	.09168	.08156	.07359	.06707
57	.41291	.21716	.15538	.12408	.10469	.09122	.08117	.07327	.06680
58	.41131	.21617	.15462	.12346	.10417	.09078	.08079	.07294	.06653
59	.40976	.21519	.15388	.12286	.10365	.09034	.08042	.07262	.06627
60	.40823	.21424	.15315	.12226	.10315	.08991	.08005	.07231	.06600
61	.40674	.21332	.15244	.12167	.10265	.08948	.07968	.07200	.06574
62	.40528	.21241	.15175	.12110	.10217	.08907	.07932	.07169	.06547
63	.40387	.21153	.15107	.12055	.10170	.08866	.07897	.07138	.06522
64	.40247	.21066	.15040	.12000	.10123	.08826	.07862	.07108	.06496
65	.40111	.20981	.14975	.11946	.10078	.08787	.07828	.07079	.06470
66	.39978	.20898	.14911	.11894	.10033	.08748	.07794	.07050	.06445
67	.39847	.20816	.14849	.11843	.09989	.08710	.07761	.07021	.06420
68	.39719	.20737	.14788	.11792	.09947	.08673	.07729	.06993	.06396
69	.39594	.20659	.14728	.11743	.09904	.08636	.07697	.06965	.06371
70	.39471	.20583	.14669	.11694	.09863	.08600	.07665	.06937	.06347

Variance of the rth Quasi-Range for Samples of n from $N(\mu, 1)$

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
71	.39351	.20508	.14612	.11647	.09822	.08565	.07634	.06910	.06324
72	.39232	.20434	.14555	.11600	.09783	.08531	.07604	.06882	.06300
73	.39116	.20362	.14500	.11554	.09743	.08496	.07574	.06856	.06276
74	.39002	.20291	.14446	.11509	.09704	.08463	.07544	.06830	.06253
75	.38890	.20222	.14392	.11465	.09667	.08430	.07515	.06804	.06230
76	.38780	.20154	.14340	.11422	.09630	.08397	.07486	.06779	.06208
77	.38672	.20087	.14289	.11379	.09593	.08365	.07458	.06753	.06186
78	.38566	.20021	.14238	.11337	.09557	.08334	.07430	.06729	.06164
79	.38463	.19957	.14188	.11296	.09522	.08303	.07403	.06704	.06142
80	.38360	.19894	.14140	.11255	.09487	.08273	.07376	.06680	.06120
81	.38260	.19832	.14092	.11216	.09453	.08242	.07349	.06656	.06099
82	.38161	.19770	.14045	.11177	.09420	.08213	.07323	.06633	.06079
83	.38064	.19711	.13999	.11138	.09386	.08184	.07297	.06610	.06058
84	.37969	.19651	.13953	.11101	.09354	.08156	.07272	.06588	.06037
85	.37874	.19593	.13908	.11064	.09322	.08127	.07247	.06565	.06018
86	.37782	.19536	.13865	.11027	.09290	.08100	.07223	.06543	.05997
87	.37691	.19480	.13820	.10991	.09259	.08072	.07198	.06521	.05978
88	.37601	.19424	.13778	.10956	.09229	.08046	.07174	.06499	.05959
89	.37513	.19370	.13736	.10920	.09199	.08019	.07150	.06479	.05939
90	.37426	.19316	.13695	.10886	.09169	.07993	.07127	.06457	.05920
91	.37340	.19264	.13654	.10852	.09139	.07967	.07104	.06437	.05901
92	.37256	.19212	.13614	.10819	.09111	.07941	.07081	.06416	.05883
93	.37173	.19160	.13575	.10786	.09082	.07916	.07059	.06396	.05865
94	.37091	.19109	.13536	.10753	.09055	.07892	.07037	.06376	.05847
95	.37010	.19060	.13498	.10721	.09027	.07868	.07015	.06357	.05829
96	.36931	.19011	.13460	.10691	.08999	.07843	.06994	.06337	.05812
97	.36852	.18963	.13423	.10659	.08973	.07820	.06973	.06318	.05794
98	.36774	.18916	.13386	.10629	.08946	.07797	.06952	.06299	.05777
99	.36699	.18868	.13350	.10599	.08920	.07773	.06931	.06281	.05760
100	.36624	.18822	.13314	.10569	.08894	.07750	.06911	.06262	.05744

Table A3

STANDARD DEVIATIONS OF QUASI-RANGES

Standard Deviation of the rth Quasi-Range for Samples of n from N(μ, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
2	.85250								
3	.88837								
4	.87981	.49902							
5	.86408	.56847							
6	.84804	.58936	.35479						
7	.83320	.59456	.42454						
8	.81983	.59356	.45377	.27572					
9	.80783	.58989	.46722	.34027					
10	.79705	.58507	.47322	.37147	.22563				
11	.78731	.57982	.47533	.38834	.28442				
12	.77848	.57448	.47528	.39787	.31533	.19101			
13	.77041	.56923	.47398	.40318	.33355	.24453			
14	.76302	.56415	.47196	.40596	.34485	.27432	.16564		
15	.75621	.55929	.46952	.40714	.35202	.29286	.21456		
16	.74990	.55465	.46686	.40729	.35655	.30504	.24294	.14623	
17	.74405	.55023	.46408	.40674	.35934	.31327	.26131	.19118	
18	.73858	.54604	.46127	.40574	.36094	.31891	.27385	.21811	.13091
19	.73348	.54205	.45846	.40443	.36172	.32278	.28268	.23604	.17243
20	.72868	.53826	.45569	.40292	.36190	.32539	.28902	.24866	.19794
21	.72417	.53466	.45297	.40127	.36166	.32710	.29361	.25781	.21533
22	.71991	.53122	.45033	.39954	.36111	.32815	.29693	.26457	.22783
23	.71588	.52796	.44775	.39777	.36033	.32870	.29932	.26964	.23711
24	.71206	.52483	.44526	.39597	.35940	.32889	.30101	.27347	.24413
25	.70843	.52185	.44284	.39417	.35834	.32878	.30217	.27635	.24952
26	.70498	.51900	.44050	.39238	.35721	.32846	.30291	.27852	.25370
27	.70169	.51626	.43823	.39061	.35602	.32798	.30333	.28014	.25695
28	.69854	.51365	.43605	.38887	.35479	.32737	.30350	.28132	.25948
29	.69554	.51113	.43393	.38716	.35353	.32666	.30347	.28215	.26145
30	.69265	.50872	.43188	.38547	.35226	.32588	.30328	.28271	.26297
31	.68989	.50640	.42990	.38383	.35098	.32504	.30296	.28304	.26414
32	.68724	.50416	.42798	.38222	.34971	.32415	.30254	.28320	.26500
33	.68468	.50200	.42612	.38064	.34845	.32324	.30205	.28320	.26564
34	.68223	.49992	.42432	.37911	.34719	.32230	.30148	.28309	.26607
35	.67986	.49791	.42257	.37761	.34596	.32136	.30087	.28288	.26635

Standard Deviation of the rth Quasi-Range for Samples of n from N(μ, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
36	.67757	.49598	.42088	.37614	.34473	.32040	.30022	.28258	.26648
37	.67537	.49410	.41924	.37472	.34353	.31944	.29953	.28222	.26651
38	.67324	.49228	.41764	.37333	.34234	.31847	.29882	.28180	.26644
39	.67118	.49053	.41609	.37197	.34117	.31751	.29810	.28135	.26629
40	.66918	.48882	.41459	.37064	.34003	.31656	.29736	.28085	.26608
41	.66724	.48716	.41312	.36935	.33890	.31561	.29661	.28032	.26582
42	.66536	.48556	.41171	.36809	.33780	.31468	.29585	.27978	.26550
43	.66354	.48401	.41032	.36686	.33671	.31375	.29509	.27921	.26515
44	.66177	.48249	.40898	.36565	.33565	.31283	.29433	.27862	.26477
45	.66005	.48101	.40766	.36448	.33461	.31192	.29357	.27802	.26436
46	.65838	.47958	.40639	.36333	.33359	.31103	.29282	.27742	.26392
47	.65676	.47819	.40514	.36221	.33258	.31015	.29206	.27681	.26347
48	.65517	.47683	.40393	.36112	.33160	.30927	.29132	.27620	.26300
49	.65363	.47551	.40274	.36004	.33063	.30842	.29058	.27558	.26252
50	.65213	.47422	.40158	.35900	.32969	.30757	.28984	.27496	.26203
51	.65066	.47296	.40045	.35797	.32876	.30674	.28911	.27434	.26153
52	.64924	.47174	.39935	.35697	.32785	.30593	.28839	.27372	.26102
53	.64784	.47053	.39827	.35599	.32696	.30512	.28768	.27310	.26051
54	.64648	.46936	.39721	.35502	.32608	.30433	.28697	.27249	.26000
55	.64515	.46822	.39618	.35408	.32523	.30356	.28628	.27189	.25948
56	.64385	.46710	.39518	.35316	.32438	.30279	.28559	.27128	.25897
57	.64258	.46601	.39418	.35226	.32356	.30203	.28490	.27068	.25845
58	.64134	.46494	.39322	.35137	.32275	.30129	.28424	.27008	.25793
59	.64012	.46389	.39227	.35051	.32195	.30056	.28358	.26949	.25742
60	.63893	.46287	.39134	.34966	.32117	.29985	.28292	.26890	.25690
61	.63776	.46186	.39043	.34882	.32040	.29914	.28228	.26833	.25639
62	.63662	.46088	.38954	.34800	.31964	.29845	.28164	.26775	.25588
63	.63550	.45992	.38868	.34720	.31890	.29776	.28102	.26718	.25538
64	.63441	.45898	.38781	.34641	.31817	.29708	.28040	.26662	.25487
65	.63333	.45805	.38698	.34564	.31746	.29643	.27979	.26607	.25437
66	.63228	.45714	.38615	.34488	.31676	.29577	.27918	.26552	.25387
67	.63124	.45625	.38534	.34413	.31606	.29513	.27859	.26496	.25338
68	.63023	.45538	.38455	.34340	.31538	.29451	.27801	.26444	.25290
69	.62924	.45452	.38377	.34268	.31471	.29388	.27743	.26390	.25242
70	.62826	.45368	.38301	.34197	.31405	.29326	.27686	.26337	.25194

Standard Deviation of the rth Quasi-Range for Samples of n from N(μ, 1)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
71	.62730	.45286	.38225	.34127	.31341	.29266	.27630	.26286	.25147
72	.62636	.45204	.38151	.34059	.31277	.29207	.27575	.26234	.25099
73	.62543	.45125	.38079	.33992	.31214	.29149	.27520	.26184	.25052
74	.62451	.45046	.38007	.33925	.31152	.29091	.27466	.26134	.25007
75	.62362	.44969	.37937	.33860	.31091	.29034	.27414	.26084	.24961
76	.62274	.44893	.37868	.33796	.31031	.28978	.27361	.26036	.24916
77	.62187	.44818	.37800	.33733	.30973	.28923	.27309	.25987	.24872
78	.62102	.44745	.37733	.33671	.30915	.28868	.27259	.25940	.24827
79	.62018	.44673	.37667	.33610	.30858	.28815	.27209	.25892	.24783
80	.61936	.44602	.37603	.33549	.30802	.28762	.27159	.25847	.24740
81	.61855	.44533	.37539	.33490	.30745	.28710	.27110	.25800	.24697
82	.61775	.44464	.37476	.33431	.30691	.28658	.27062	.25755	.24655
83	.61696	.44397	.37415	.33374	.30637	.28608	.27014	.25711	.24612
84	.61619	.44330	.37354	.33318	.30584	.28558	.26967	.25666	.24571
85	.61542	.44264	.37293	.33262	.30531	.28508	.26920	.25622	.24531
86	.61467	.44199	.37235	.33206	.30480	.28460	.26875	.25579	.24489
87	.61393	.44136	.37176	.33153	.30429	.28412	.26829	.25536	.24449
88	.61320	.44073	.37119	.33099	.30379	.28365	.26785	.25494	.24410
89	.61248	.44011	.37063	.33046	.30329	.28318	.26740	.25453	.24370
90	.61177	.43950	.37007	.32994	.30280	.28272	.26697	.25411	.24332
91	.61107	.43890	.36952	.32943	.30231	.28226	.26654	.25371	.24293
92	.61038	.43831	.36898	.32893	.30184	.28181	.26611	.25330	.24256
93	.60970	.43772	.36844	.32842	.30137	.28136	.26569	.25290	.24218
94	.60902	.43714	.36791	.32792	.30091	.28092	.26528	.25251	.24180
95	.60836	.43657	.36739	.32744	.30044	.28049	.26487	.25212	.24144
96	.60770	.43602	.36688	.32696	.29999	.28006	.26445	.25174	.24107
97	.60706	.43547	.36637	.32649	.29955	.27964	.26406	.25136	.24071
98	.60642	.43492	.36587	.32602	.29911	.27923	.26366	.25098	.24036
99	.60579	.43438	.36538	.32556	.29866	.27881	.26328	.25062	.24001
100	.60517	.43384	.36489	.32510	.29823	.27840	.26288	.25025	.23966

Table A4

EFFICIENCY OF POINT ESTIMATORS OF σ BASED ON QUASI-RANGES

Efficiency (Percent) of Estimate of Population Standard Deviation Based on the rth Quasi-Range for Samples of n from $N(\mu, \sigma^2)$

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
2	100.00								
3	99.19								
4	97.52	25.24							
5	95.48	39.97							
6	93.30	49.55	13.48						
7	91.12	56.14	23.88						
8	89.00	60.84	32.05	9.03					
9	86.95	64.27	38.56	16.75					
10	84.99	66.80	43.83	23.33	6.74				
11	83.13	68.67	48.14	28.97	12.80				
12	81.36	70.07	51.69	33.82	18.21	5.36			
13	79.68	71.09	54.65	38.00	23.04	10.32			
14	78.09	71.83	57.12	41.64	27.34	14.88	4.44		
15	76.57	72.35	59.20	44.80	31.19	19.05	8.62		
16	75.13	72.69	60.95	47.57	34.63	22.86	12.54	3.78	
17	73.76	72.89	62.44	50.00	37.71	26.34	16.19	7.40	
18	72.46	72.98	63.70	52.14	40.48	29.52	19.58	10.82	3.30
19	71.21	72.98	64.76	54.03	42.97	32.42	22.73	14.06	6.47
20	70.02	72.91	65.67	55.70	45.23	35.09	25.65	17.10	9.51
21	68.88	72.77	66.43	57.19	47.26	37.53	28.36	19.96	12.41
22	67.80	72.59	67.08	58.51	49.11	39.76	30.88	22.64	15.16
23	66.75	72.37	67.62	59.68	50.78	41.82	33.21	25.16	17.77
24	65.75	72.11	68.07	60.73	52.31	43.72	35.38	27.52	20.24
25	64.79	71.82	68.45	61.66	53.69	45.46	37.40	29.73	22.57
26	63.86	71.52	68.76	62.49	54.96	47.07	39.28	31.81	24.78
27	62.97	71.20	69.00	63.24	56.11	48.56	41.03	33.76	26.87
28	62.12	70.86	69.20	63.90	57.17	49.94	42.66	35.59	28.85
29	61.29	70.51	69.35	64.49	58.13	51.21	44.19	37.31	30.72
30	60.49	70.15	69.46	65.01	59.01	52.39	45.61	38.93	32.49
31	59.72	69.78	69.53	65.48	59.82	53.48	46.94	40.45	34.16
32	58.98	69.41	69.57	65.90	60.56	54.50	48.19	41.89	35.74
33	58.26	69.03	69.58	66.26	61.24	55.44	49.36	43.24	37.24
34	57.56	68.66	69.57	66.59	61.86	56.32	50.45	44.51	38.66
35	56.89	68.28	69.53	66.87	62.43	57.13	51.47	45.71	40.01

Efficiency (Percent) of Estimate of Population Standard Deviation Based on the rth Quasi-Range for Samples of n from N (μ, σ^2)

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
36	56.23	67.89	69.48	67.12	62.95	57.89	52.44	46.85	41.29
37	55.60	67.51	69.41	67.34	63.42	58.60	53.34	47.92	42.50
38	54.98	67.13	69.32	67.53	63.86	59.26	54.19	48.93	43.66
39	54.39	66.76	69.21	67.69	64.26	59.87	54.99	49.89	44.75
40	53.81	66.38	69.10	67.82	64.63	60.44	55.74	50.80	45.79
41	53.24	66.00	68.97	67.94	64.96	60.97	56.44	51.66	46.78
42	52.70	65.63	68.83	68.03	65.27	61.46	57.11	52.47	47.72
43	52.16	65.26	68.68	68.10	65.55	61.92	57.73	53.24	48.61
44	51.64	64.89	68.53	68.16	65.80	62.35	58.32	53.97	49.47
45	51.14	64.53	68.37	68.20	66.02	62.75	58.87	54.66	50.28
46	50.64	64.17	68.20	68.22	66.23	63.13	59.39	55.31	51.05
47	50.16	63.81	68.02	68.24	66.42	63.47	59.89	55.93	51.79
48	49.70	63.46	67.84	68.23	66.59	63.80	60.35	56.52	52.49
49	49.24	63.11	67.66	68.22	66.74	64.10	60.79	57.08	53.16
50	48.79	62.76	67.47	68.20	66.87	64.38	61.20	57.61	53.79
51	48.36	62.42	67.28	68.17	66.99	64.64	61.58	58.12	54.41
52	47.93	62.08	67.09	68.12	67.09	64.88	61.95	58.59	54.99
53	47.52	61.74	66.89	68.07	67.18	65.10	62.29	59.05	55.54
54	47.11	61.41	66.69	68.02	67.26	65.31	62.62	59.48	56.07
55	46.71	61.08	66.49	67.95	67.33	65.50	62.92	59.89	56.58
56	46.33	60.76	66.28	67.87	67.38	65.67	63.21	60.28	57.06
57	45.95	60.44	66.08	67.80	67.43	65.84	63.49	60.65	57.52
58	45.57	60.12	65.88	67.71	67.46	65.98	63.74	61.01	57.96
59	45.21	59.81	65.67	67.62	67.49	66.12	63.98	61.34	58.38
60	44.85	59.50	65.46	67.53	67.51	66.25	64.20	61.66	58.79
61	44.51	59.20	65.26	67.43	67.52	66.36	64.41	61.96	59.17
62	44.16	58.89	65.05	67.33	67.52	66.46	64.61	62.25	59.54
63	43.83	58.59	64.84	67.22	67.52	66.56	64.80	62.52	59.89
64	43.50	58.30	64.63	67.11	67.50	66.64	64.97	62.78	60.23
65	43.18	58.01	64.42	67.00	67.49	66.71	65.14	63.02	60.55
66	42.86	57.72	64.22	66.88	67.46	66.78	65.29	63.25	60.86
67	42.55	57.44	64.01	66.76	67.44	66.84	65.43	63.48	61.15
68	42.25	57.15	63.80	66.64	67.40	66.89	65.56	63.68	61.43
69	41.95	56.88	63.59	66.52	67.36	66.94	65.69	63.88	61.70
70	41.65	56.60	63.38	66.39	67.32	66.98	65.80	64.07	61.96

Efficiency (Percent) of Estimate of Population Standard Deviation Based on

r^{th} Quasi-Range for Samples of n from $N(\mu, \sigma^2)$

n	r = 0	r = 1	r = 2	r = 3	r = 4	r = 5	r = 6	r = 7	r = 8
71	41.37	56.33	63.18	66.27	67.27	67.01	65.91	64.25	62.20
72	41.08	56.06	62.97	66.14	67.22	67.03	66.01	64.42	62.44
73	40.81	55.80	62.77	66.00	67.16	67.05	66.10	64.58	62.66
74	40.53	55.53	62.56	65.87	67.11	67.06	66.19	64.73	62.88
75	40.26	55.27	62.36	65.74	67.04	67.07	66.26	64.88	63.08
76	40.00	55.02	62.16	65.60	66.98	67.08	66.33	65.01	63.28
77	39.74	54.77	61.96	65.47	66.91	67.07	66.40	65.14	63.46
78	39.49	54.52	61.76	65.33	66.84	67.07	66.45	65.25	63.64
79	39.24	54.27	61.56	65.19	66.76	67.06	66.51	65.37	63.81
80	38.99	54.02	61.36	65.05	66.69	67.04	66.56	65.47	63.97
81	38.75	53.78	61.16	64.91	66.61	67.03	66.60	65.58	64.12
82	38.51	53.54	60.97	64.77	66.53	67.01	66.63	65.67	64.27
83	38.27	53.30	60.77	64.63	66.45	66.98	66.67	65.75	64.41
84	38.04	53.07	60.58	64.49	66.36	66.95	66.69	65.84	64.54
85	37.81	52.84	60.38	64.35	66.27	66.92	66.72	65.91	64.67
86	37.59	52.61	60.19	64.21	66.18	66.89	66.73	65.98	64.79
87	37.37	52.38	60.00	64.06	66.09	66.85	66.75	66.05	64.90
88	37.15	52.16	59.81	63.92	66.00	66.81	66.76	66.11	65.01
89	36.94	51.94	59.62	63.78	65.91	66.77	66.77	66.16	65.12
90	36.73	51.72	59.43	63.63	65.81	66.72	66.77	66.22	65.21
91	36.52	51.50	59.25	63.49	65.72	66.68	66.77	66.26	65.31
92	36.31	51.29	59.06	63.35	65.62	66.63	66.77	66.31	65.39
93	36.11	51.08	58.88	63.20	65.53	66.58	66.76	66.35	65.47
94	35.91	50.87	58.70	63.06	65.42	66.52	66.75	66.38	65.55
95	35.72	50.66	58.51	62.92	65.33	66.46	66.74	66.41	65.62
96	35.52	50.45	58.33	62.78	65.23	66.41	66.73	66.44	65.69
97	35.33	50.25	58.15	62.63	65.12	66.35	66.71	66.46	65.76
98	35.14	50.05	57.98	62.49	65.02	66.29	66.69	66.49	65.82
99	34.96	49.85	57.80	62.35	64.92	66.23	66.67	66.50	65.87
100	34.77	49.65	57.62	62.21	64.82	66.16	66.65	66.52	65.93

Table A5

MOST EFFICIENT POINT ESTIMATORS OF σ BASED ON QUASI-RANGES

$[w_r = x_{n-r} - x_{r+1} = r$th **quasi-range of sample,** $r = 0(1)8$; $s = [\Sigma(x-\bar{x})^2/(n-1)]^{1/2}$ **= sample standard deviation**$]$

Most Efficient Unbiased Estimates of Standard Deviation of Normal Population

Sample size, n	Based on one quasi-range Estimate	Eff(%)	Based on two adjacent quasi-ranges Estimate	Eff(%)	Based on any two quasi-ranges* Estimate	Eff(%)	Efficient Estimate
2	$.886227\ w_o$	100.00					s/. 797885
3	$.590818\ w_o$	99.19					s/. 886227
4	$.485731\ w_o$	97.52	$.45394\ (w_o + 0.2427\ w_1)$	98.92	$.45394\ (w_o + 0.2427\ w_1)$	98.92	s/. 921318
5	$.429936\ w_o$	95.48	$.37238\ (w_o + 0.3631\ w_1)$	98.84	$.37238\ (w_o + 0.3631\ w_1)$	98.84	s/. 939986
6	$.394569\ w_o$	93.30	$.31803\ (w_o + 0.4752\ w_1)$	98.66	$.31803\ (w_o + 0.4752\ w_1)$	98.66	s/. 951533
7	$.369774\ w_o$	91.12	$.27922\ (w_o + 0.5790\ w_1)$	98.32	$.27922\ (w_o + 0.5790\ w_1)$	98.32	s/. 959369
8	$.351222\ w_o$	89.00	$.25010\ (w_o + 0.6754\ w_1)$	97.84	$.25010\ (w_o + 0.6754\ w_1)$	97.84	s/. 965030
9	$.336697\ w_o$	86.95	$.22745\ (w_o + 0.7651\ w_1)$	97.23	$.22745\ (w_o + 0.7651\ w_1)$	97.23	s/. 969311
10	$.324939\ w_o$	84.99	$.20931\ (w_o + 0.8489\ w_1)$	96.54	$.20931\ (w_o + 0.8489\ w_1)$	96.54	s/. 972659
11	$.315172\ w_o$	83.13	$.19444\ (w_o + 0.9276\ w_1)$	95.78	$.19444\ (w_o + 0.9276\ w_1)$	95.78	s/. 975350
12	$.306894\ w_o$	81.36	$.18203\ (w_o + 1.0017\ w_1)$	94.97	$.21177\ (w_o + 0.9231\ w_2)$	95.17	s/. 977559
13	$.299762\ w_o$	79.68	$.17150\ (w_o + 1.0717\ w_1)$	94.12	$.19848\ (w_o + 1.0015\ w_2)$	95.00	s/. 979406
14	$.293534\ w_o$	78.09	$.16244\ (w_o + 1.1381\ w_1)$	93.26	$.18704\ (w_o + 1.0762\ w_2)$	94.77	s/. 980971
15	$.288033\ w_o$	76.57	$.15457\ (w_o + 1.2011\ w_1)$	92.39	$.17708\ (w_o + 1.1477\ w_2)$	94.50	s/. 982316
16	$.283127\ w_o$	75.13	$.14765\ (w_o + 1.2612\ w_1)$	91.52	$.16834\ (w_o + 1.2161\ w_2)$	94.18	s/. 983484
17	$.278716\ w_o$	73.76	$.14153\ (w_o + 1.3186\ w_1)$	90.65	$.16060\ (w_o + 1.2817\ w_2)$	93.82	s/. 984506
18	$.370257\ w_1$	72.98	$.13606\ (w_o + 1.3736\ w_1)$	89.78	$.15369\ (w_o + 1.3448\ w_2)$	93.43	s/. 985410
19	$.362335\ w_1$	72.98	$.13114\ (w_o + 1.4263\ w_1)$	88.92	$.14750\ (w_o + 1.4055\ w_2)$	93.02	s/. 986214
20	$.355214\ w_1$	72.91	$.12670\ (w_o + 1.4769\ w_1)$	88.08	$.14192\ (w_o + 1.4640\ w_2)$	92.59	s/. 986934
21	$.348768\ w_1$	72.77	$.12266\ (w_o + 1.5256\ w_1)$	87.24	$.13684\ (w_o + 1.5206\ w_2)$	92.14	s/. 987583
22	$.342899\ w_1$	72.59	$.11897\ (w_o + 1.5[illegible]\ w_1)$	86.42	$.14637\ (w_o + 1.5298\ w_3)$	91.78	s/. 988170
23	$.337526\ w_1$	72.37	$.11558\ (w_o + 1.61[illegible]\ w_1)$	85.62	$.14129\ (w_o + 1.5881\ w_3)$	91.61	s/. 988705
24	$.332584\ w_1$	72.11	$.11246\ (w_o + 1.6617\ w_1)$	84.83	$.13663\ (w_o + 1.6446\ w_3)$	91.42	s/. 989193
25	$.328019\ w_1$	71.82	$.10958\ (w_o + 1.7040\ w_1)$	84.05	$.13233\ (w_o + 1.6996\ w_3)$	91.21	s/. 989640

*Quasi-ranges 0 through 8 only

Most Efficient Unbiased Estimates of Standard Deviation of Normal Population

Sample size, n	Based on one quasi-range		Based on two adjacent quasi-ranges		Based on any two quasi-ranges *		Efficient
	Estimate	Eff(%)	Estimate	Eff(%)	Estimate	Eff(%)	Estimate
26	$.323785\ w_1$	71.52	$.10691\ (w_o + 1.7451\ w_1)$	83.29	$.12836\ (w_o + 1.7529\ w_3)$	90.98	s/.990052
27	$.319844\ w_1$	71.20	$.10442\ (w_o + 1.7849\ w_1)$	82.54	$.12468\ (w_o + 1.8050\ w_3)$	90.73	s/.990433
28	$.316165\ w_1$	70.86	$.10209\ (w_o + 1.8235\ w_1)$	81.81	$.12126\ (w_o + 1.8556\ w_3)$	90.48	s/.990786
29	$.312719\ w_1$	70.51	$.09992\ (w_o + 1.8610\ w_1)$	81.10	$.11807\ (w_o + 1.9050\ w_3)$	90.21	s/.991113
30	$.309483\ w_1$	70.15	$.09788\ (w_o + 1.8975\ w_1)$	80.40	$.11508\ (w_o + 1.9532\ w_3)$	89.93	s/.991418
31	$.306436\ w_1$	69.78	$.09596\ (w_o + 1.9329\ w_1)$	79.71	$.11229\ (w_o + 2.0002\ w_3)$	89.63	s/.991703
32	$.357181\ w_2$	69.57	$.09416\ (w_o + 1.9675\ w_1)$	79.04	$.10967\ (w_o + 2.0461\ w_3)$	89.35	s/.991969
33	$.353016\ w_2$	69.58	$.09245\ (w_o + 2.0011\ w_1)$	78.38	$.11551\ (w_o + 2.0673\ w_4)$	89.11	s/.992219
34	$.349094\ w_2$	69.57	$.14484\ (w_1 + 1.2398\ w_2)$	78.08	$.11282\ (w_o + 2.1150\ w_4)$	88.97	s/.992454
35	$.345394\ w_2$	69.53	$.14201\ (w_1 + 1.2646\ w_2)$	77.82	$.11028\ (w_o + 2.1616\ w_4)$	88.82	s/.992675
36	$.341895\ w_2$	69.48	$.13934\ (w_1 + 1.2888\ w_2)$	77.55	$.10788\ (w_o + 2.2073\ w_4)$	88.66	s/.992884
37	$.338580\ w_2$	69.41	$.13680\ (w_1 + 1.3126\ w_2)$	77.27	$.10561\ (w_o + 2.2520\ w_4)$	88.48	s/.993080
38	$.335433\ w_2$	69.32	$.13440\ (w_1 + 1.3358\ w_2)$	76.99	$.10345\ (w_o + 2.2962\ w_4)$	88.31	s/.993267
39	$.332442\ w_2$	69.21	$.13211\ (w_1 + 1.3586\ w_2)$	76.71	$.10141\ (w_o + 2.3393\ w_4)$	88.12	s/.993443
40	$.329593\ w_2$	69.10	$.12995\ (w_1 + 1.3806\ w_2)$	76.42	$.09947\ (w_o + 2.3816\ w_4)$	87.92	s/.993611
41	$.326875\ w_2$	68.97	$.12788\ (w_1 + 1.4026\ w_2)$	76.12	$.09762\ (w_o + 2.4232\ w_4)$	87.73	s/.993770
42	$.324280\ w_2$	68.83	$.12592\ (w_1 + 1.4236\ w_2)$	75.82	$.09586\ (w_o + 2.4640\ w_4)$	87.52	s/.993922
43	$.321798\ w_2$	68.68	$.12403\ (w_1 + 1.4448\ w_2)$	75.53	$.09418\ (w_o + 2.5042\ w_4)$	87.32	s/.994066
44	$.319420\ w_2$	68.53	$.12223\ (w_1 + 1.4652\ w_2)$	75.23	$.09258\ (w_o + 2.5435\ w_4)$	87.10	s/.994203
45	$.317141\ w_2$	68.37	$.12051\ (w_1 + 1.4853\ w_2)$	74.92	$.09647\ (w_o + 2.5741\ w_5)$	86.97	s/.994335
46	$.352208\ w_3$	68.22	$.11886\ (w_1 + 1.5051\ w_2)$	74.62	$.09482\ (w_o + 2.6150\ w_5)$	86.85	s/.994460
47	$.349387\ w_3$	68.24	$.11727\ (w_1 + 1.5246\ w_2)$	74.32	$.09323\ (w_o + 2.6553\ w_5)$	86.73	s/.994580
48	$.346682\ w_3$	68.23	$.15270\ (w_2 + 1.1550\ w_3)$	74.15	$.09171\ (w_o + 2.6951\ w_5)$	86.60	s/.994695
49	$.344086\ w_3$	68.22	$.15056\ (w_2 + 1.1714\ w_3)$	74.03	$.09025\ (w_o + 2.7341\ w_5)$	86.47	s/.994806
50	$.341592\ w_3$	68.20	$.14850\ (w_2 + 1.1877\ w_3)$	73.90	$.08885\ (w_o + 2.7726\ w_5)$	86.33	s/.994911

*Quasi-ranges 0 through 8 only

Most Efficient Unbiased Estimates of Standard Deviation of Normal Population

Sample size, n	Based on one quasi-range: Estimate	Eff(%)	Based on two adjacent quasi-ranges: Estimate	Eff(%)	Based on any two quasi-ranges*: Estimate	Eff(%)	Efficient Estimate
51	$.339192\ w_3$	68.17	$.14651\ (w_2 + 1.2037\ w_3)$	73.77	$.08751\ (w_o + 2.8105\ w_5)$	86.19	s/.995013
52	$.336882\ w_3$	68.12	$.14460\ (w_2 + 1.2195\ w_3)$	73.63	$.08621\ (w_o + 2.8479\ w_5)$	86.04	s/.995110
53	$.334656\ w_3$	68.07	$.14278\ (w_2 + 1.2348\ w_3)$	73.48	$.08497\ (w_o + 2.8847\ w_5)$	85.89	s/.995204
54	$.332509\ w_3$	68.02	$.14100\ (w_2 + 1.2504\ w_3)$	73.33	$.08377\ (w_o + 2.9212\ w_5)$	85.73	s/.995294
55	$.330436\ w_3$	67.95	$.13931\ (w_2 + 1.2652\ w_3)$	73.18	$.08262\ (w_o + 2.9567\ w_5)$	85.57	s/.995381
56	$.328434\ w_3$	67.87	$.13763\ (w_2 + 1.2805\ w_3)$	73.02	$.13787\ (w_1 + 1.6820\ w_8)$	85.44	s/.995465
57	$.326498\ w_3$	67.80	$.13606\ (w_2 + 1.2949\ w_3)$	72.86	$.13592\ (w_1 + 1.7062\ w_8)$	85.46	s/.995546
58	$.324625\ w_3$	67.71	$.13453\ (w_2 + 1.3093\ w_3)$	72.70	$.13403\ (w_1 + 1.7303\ w_8)$	85.47	s/.995624
59	$.322812\ w_3$	67.62	$.13304\ (w_2 + 1.3236\ w_3)$	72.53	$.13222\ (w_1 + 1.7539\ w_8)$	85.48	s/.995699
60	$.321055\ w_3$	67.53	$.13161\ (w_2 + 1.3374\ w_3)$	72.36	$.13046\ (w_1 + 1.7774\ w_8)$	85.48	s/.995772
61	$.347463\ w_4$	67.52	$.13022\ (w_2 + 1.3514\ w_3)$	72.19	$.12875\ (w_1 + 1.8006\ w_8)$	85.47	s/.995842
62	$.345399\ w_4$	67.52	$.15710\ (w_3 + 1.1114\ w_4)$	72.06	$.12710\ (w_1 + 1.8236\ w_8)$	85.46	s/.995910
63	$.343400\ w_4$	67.52	$.15534\ (w_3 + 1.1243\ w_4)$	71.99	$.12551\ (w_1 + 1.8461\ w_8)$	85.44	s/.995976
64	$.341461\ w_4$	67.50	$.15370\ (w_3 + 1.1360\ w_4)$	71.91	$.12397\ (w_1 + 1.8684\ w_8)$	85.42	s/.996040
65	$.339581\ w_4$	67.49	$.15210\ (w_3 + 1.1478\ w_4)$	71.83	$.12247\ (w_1 + 1.8907\ w_8)$	85.40	s/.996102
66	$.337755\ w_4$	67.46	$.15052\ (w_3 + 1.1598\ w_4)$	71.75	$.12102\ (w_1 + 1.9125\ w_8)$	85.36	s/.996161
67	$.335982\ w_4$	67.44	$.14895\ (w_3 + 1.1723\ w_4)$	71.67	$.11961\ (w_1 + 1.9342\ w_8)$	85.33	s/.996219
68	$.334260\ w_4$	67.40	$.14750\ (w_3 + 1.1835\ w_4)$	71.57	$.11826\ (w_1 + 1.9554\ w_8)$	85.29	s/.996276
69	$.332585\ w_4$	67.36	$.14607\ (w_3 + 1.1949\ w_4)$	71.48	$.11693\ (w_1 + 1.9765\ w_8)$	85.24	s/.996330
70	$.330956\ w_4$	67.32	$.14466\ (w_3 + 1.2064\ w_4)$	71.39	$.11564\ (w_1 + 1.9975\ w_8)$	85.20	s/.996383
71	$.329370\ w_4$	67.27	$.14333\ (w_3 + 1.2172\ w_4)$	71.29	$.11439\ (w_1 + 2.0181\ w_8)$	85.14	s/.996435
72	$.327827\ w_4$	67.22	$.14201\ (w_3 + 1.2284\ w_4)$	71.18	$.11317\ (w_1 + 2.0387\ w_8)$	85.09	s/.996485
73	$.326323\ w_4$	67.16	$.14071\ (w_3 + 1.2395\ w_4)$	71.08	$.11198\ (w_1 + 2.0593\ w_8)$	85.04	s/.996534
74	$.324857\ w_4$	67.11	$.13943\ (w_3 + 1.2510\ w_4)$	70.98	$.11083\ (w_1 + 2.0793\ w_8)$	84.98	s/.996581
75	$.346274\ w_5$	67.07	$.13821\ (w_3 + 1.2617\ w_4)$	70.87	$.10971\ (w_1 + 2.0992\ w_8)$	84.91	s/.996627

*Quasi-ranges 0 through 8 only

Most Efficient Unbiased Estimates of Standard Deviation of Normal Population

Sample size, n	Based on one quasi-range Estimate	Eff(%)	Based on two adjacent quasi-ranges Estimate	Eff(%)	Based on any two quasi-ranges* Estimate	Eff(%)	Efficient Estimate
76	$.344605\ w_5$	67.08	$.13703\ (w_3 + 1.2723\ w_4)$	70.75	$.10862\ (w_1 + 2.1188\ w_8)$	84.85	s/.996672
77	$.342979\ w_5$	67.07	$.15847\ (w_4 + 1.0948\ w_5)$	70.71	$.10756\ (w_1 + 2.1382\ w_8)$	84.78	s/.996716
78	$.341393\ w_5$	67.07	$.15704\ (w_4 + 1.1049\ w_5)$	70.66	$.10653\ (w_1 + 2.1575\ w_8)$	84.71	s/.996759
79	$.339847\ w_5$	67.06	$.15568\ (w_4 + 1.1145\ w_5)$	70.61	$.10552\ (w_1 + 2.1766\ w_8)$	84.63	s/.996800
80	$.338338\ w_5$	67.04	$.15431\ (w_4 + 1.1245\ w_5)$	70.56	$.10453\ (w_1 + 2.1956\ w_8)$	84.56	s/.996841
81	$.336865\ w_5$	67.03	$.15305\ (w_4 + 1.1334\ w_5)$	70.50	$.10357\ (w_1 + 2.2145\ w_8)$	84.48	s/.996880
82	$.335427\ w_5$	67.01	$.15176\ (w_4 + 1.1432\ w_5)$	70.44	$.10264\ (w_1 + 2.2328\ w_8)$	84.40	s/.996918
83	$.334022\ w_5$	66.98	$.15056\ (w_4 + 1.1519\ w_5)$	70.38	$.10171\ (w_1 + 2.2515\ w_8)$	84.32	s/.996956
84	$.332649\ w_5$	66.95	$.14934\ (w_4 + 1.1612\ w_5)$	70.31	$.10082\ (w_1 + 2.2696\ w_8)$	84.23	s/.996993
85	$.331306\ w_5$	66.92	$.14809\ (w_4 + 1.1714\ w_5)$	70.25	$.09996\ (w_1 + 2.2875\ w_8)$	84.15	s/.997028
86	$.329994\ w_5$	66.89	$.14697\ (w_4 + 1.1800\ w_5)$	70.18	$.09910\ (w_1 + 2.3057\ w_8)$	84.07	s/.997063
87	$.328710\ w_5$	66.85	$.14584\ (w_4 + 1.1890\ w_5)$	70.11	$.09826\ (w_1 + 2.3234\ w_8)$	83.97	s/.997097
88	$.327454\ w_5$	66.81	$.14475\ (w_4 + 1.1977\ w_5)$	70.03	$.09746\ (w_1 + 2.3406\ w_8)$	83.88	s/.997131
89	$.345465\ w_6$	66.77	$.14363\ (w_4 + 1.2071\ w_5)$	69.96	$.09665\ (w_1 + 2.3585\ w_8)$	83.79	s/.997163
90	$.344065\ w_6$	66.77	$.14259\ (w_4 + 1.2156\ w_5)$	69.88	$.09588\ (w_1 + 2.3755\ w_8)$	83.70	s/.997195
91	$.342694\ w_6$	66.77	$.16064\ (w_5 + 1.0751\ w_6)$	69.82	$.09511\ (w_1 + 2.3930\ w_8)$	83.61	s/.997226
92	$.341353\ w_6$	66.77	$.15934\ (w_5 + 1.0844\ w_6)$	69.79	$.09437\ (w_1 + 2.4096\ w_8)$	83.51	s/.997257
93	$.340040\ w_6$	66.76	$.15823\ (w_5 + 1.0916\ w_6)$	69.75	$.09364\ (w_1 + 2.4264\ w_8)$	83.42	s/.997286
94	$.338754\ w_6$	66.75	$.15705\ (w_5 + 1.0999\ w_6)$	69.71	$.09293\ (w_1 + 2.4431\ w_8)$	83.32	s/.997315
95	$.337494\ w_6$	66.74	$.15592\ (w_5 + 1.1078\ w_6)$	69.67	$.09223\ (w_1 + 2.4595\ w_8)$	83.22	s/.997344
96	$.336259\ w_6$	66.73	$.15480\ (w_5 + 1.1158\ w_6)$	69.63	$.09155\ (w_1 + 2.4761\ w_8)$	83.12	s/.997371
97	$.335049\ w_6$	66.71	$.15366\ (w_5 + 1.1244\ w_6)$	69.59	$.09087\ (w_1 + 2.4924\ w_8)$	83.02	s/.997399
98	$.333863\ w_6$	66.69	$.15261\ (w_5 + 1.1319\ w_6)$	69.54	$.09022\ (w_1 + 2.5085\ w_8)$	82.92	s/.997426
99	$.332700\ w_6$	66.67	$.15161\ (w_5 + 1.1389\ w_6)$	69.49	$.08957\ (w_1 + 2.5245\ w_8)$	82.82	s/.997452
100	$.331559\ w_6$	66.65	$.15059\ (w_5 + 1.1466\ w_6)$	69.44	$.08895\ (w_1 + 2.5401\ w_8)$	82.71	s/.997478

*Quasi-ranges 0 through 8 only

Table A6

PROBABILITY INTEGRAL $P(W_r, n)$ OF THE rth QUASI-RANGE W_r FOR SAMPLES OF SIZE n FROM $N(\mu, 1)$

W_0	$P(W_0,2)$	$P(W_0,3)$	$P(W_0,4)$	$P(W_0,5)$	$P(W_0,6)$
0.05	.0282 0360	.0006 8892	.0000 1587	.0000 0035	.0000 0001
0.10	.0563 7198	.0027 5282	.0001 2675	.0000 0565	.0000 0025
0.15	.0844 7003	.0061 8311	.0004 2678	.0000 2852	.0000 0187
0.20	.1124 6292	.0109 6555	.0010 0831	.0000 8978	.0000 0783
0.25	.1403 1620	.0170 8034	.0019 6109	.0002 1805	.0000 2376
0.30	.1679 9597	.0245 0227	.0033 7139	.0004 4927	.0000 5867
0.35	.1954 6894	.0332 0087	.0053 2125	.0008 2606	.0001 2567
0.40	.2227 0259	.0431 4064	.0078 8775	.0013 9701	.0002 4248
0.45	.2496 6529	.0542 8131	.0111 4231	.0022 1580	.0004 3186
0.50	.2763 2639	.0665 7805	.0151 5009	.0033 4032	.0007 2185
0.55	.3026 5634	.0799 8186	.0199 6943	.0048 3161	.0011 4588
0.60	.3286 2676	.0944 3981	.0256 5143	.0067 5290	.0017 4271
0.65	.3542 1057	.1098 9547	.0322 3954	.0091 6846	.0025 5621
0.70	.3793 8205	.1262 8920	.0397 6924	.0121 4253	.0036 3502
0.75	.4041 1691	.1435 5862	.0482 6791	.0157 3827	.0050 3195
0.80	.4283 9236	.1616 3894	.0577 5461	.0200 1666	.0068 0339
0.85	.4521 8716	.1804 6338	.0682 4013	.0250 3549	.0090 0851
0.90	.4754 8172	.1999 6360	.0797 2700	.0308 4841	.0117 0835
0.95	.4982 5805	.2200 7010	.0922 0961	.0375 0403	.0149 6489
1.00	.5204 9988	.2407 1264	.1056 7449	.0450 4514	.0188 4003
1.05	.5421 9261	.2618 2062	.1201 0051	.0535 0800	.0233 9449
1.10	.5633 2337	.2833 2349	.1354 5932	.0629 2172	.0286 8679
1.15	.5838 8101	.3051 5117	.1517 1572	.0733 0781	.0347 7217
1.20	.6038 5609	.3272 3434	.1688 2815	.0846 7982	.0417 0159
1.25	.6232 4088	.3495 0487	.1867 4922	.0970 4308	.0495 2076
1.30	.6420 2933	.3718 9613	.2054 2629	.1103 9460	.0582 6925
1.35	.6602 1703	.3943 4329	.2248 0203	.1247 2306	.0679 7974
1.40	.6778 0119	.4167 8361	.2448 1508	.1400 0895	.0786 7733
1.45	.6947 8062	.4391 5672	.2654 0071	.1562 2479	.0903 7900
1.50	.7111 5563	.4614 0484	.2864 9141	.1733 3546	.1030 9320
1.55	.7269 2801	.4834 7303	.3080 1760	.1912 9863	.1168 1959
1.60	.7421 0096	.5053 0931	.3299 0823	.2100 6530	.1315 4889
1.65	.7566 7904	.5268 6486	.3520 9145	.2295 8035	.1472 6292
1.70	.7706 6806	.5480 9415	.3744 9522	.2497 8324	.1639 3473
1.75	.7840 7506	.5689 5503	.3970 4788	.2706 0866	.1815 2891
1.80	.7969 0821	.5894 0877	.4196 7871	.2919 8730	.2000 0198
1.85	.8091 7673	.6094 2015	.4423 1846	.3138 4661	.2193 0293
1.90	.8208 9081	.6289 5749	.4648 9983	.3361 1154	.2393 7382
1.95	.8320 6153	.6479 9257	.4873 5792	.3587 0540	.2601 5050
2.00	.8427 0079	.6665 0067	.5096 3059	.3815 5052	.2815 6340
2.05	.8528 2123	.6844 6052	.5316 5886	.4045 6909	.3035 3836
2.10	.8624 3611	.7018 5418	.5533 8718	.4276 8381	.3259 9747
2.15	.8715 5928	.7186 6697	.5747 6366	.4508 1862	.3488 6001
2.20	.8802 0507	.7348 8741	.5957 4033	.4738 9929	.3720 4332
2.25	.8883 8823	.7505 0701	.6162 7324	.4968 5402	.3954 6372
2.30	.8961 2384	.7655 2022	.6363 2262	.5196 1399	.4190 3733
2.35	.9034 2725	.7799 2423	.6558 5290	.5421 1377	.4426 8100
2.40	.9103 1398	.7937 1884	.6748 3276	.5642 9178	.4663 1298
2.45	.9167 9970	.8069 0628	.6932 3512	.5860 9060	.4898 5378
2.50	.9229 0013	.8194 9106	.7110 3706	.6074 5724	.5132 2674

W_0	$P(W_0,2)$	$P(W_0,3)$	$P(W_0,4)$	$P(W_0,5)$	$P(W_0,6)$
2.55	.9286 3099	.8314 7978	.7282 1977	.6283 4338	.5363 5871
2.60	.9340 0794	.8428 8096	.7447 6840	.6487 0549	.5591 8054
2.65	.9390 4655	.8537 0487	.7606 7194	.6685 0496	.5816 2753
2.70	.9437 6220	.8639 6333	.7759 2304	.6877 0808	.6036 3983
2.75	.9481 7007	.8736 6959	.7905 1782	.7062 8607	.6251 6270
2.80	.9522 8512	.8828 3810	.8044 5570	.7242 1500	.6461 4678
2.85	.9561 2199	.8914 8436	.8177 3914	.7414 7565	.6665 4817
2.90	.9596 9503	.8996 2480	.8303 7343	.7580 5340	.6863 2854
2.95	.9630 1821	.9072 7657	.8423 6647	.7739 3803	.7054 5511
3.00	.9661 0515	.9144 5743	.8537 2852	.7891 2350	.7239 0062
3.05	.9689 6906	.9211 8557	.8644 7196	.8036 0770	.7416 4318
3.10	.9716 2273	.9274 7955	.8746 1105	.8173 9223	.7586 6613
3.15	.9740 7854	.9333 5808	.8841 6173	.8304 8207	.7749 5781
3.20	.9763 4838	.9388 4000	.8931 4133	.8428 8534	.7905 1132
3.25	.9784 4373	.9439 4411	.9015 6841	.8546 1300	.8053 2426
3.30	.9803 7559	.9486 8909	.9094 6250	.8656 7852	.8193 9837
3.35	.9821 5447	.9530 9345	.9168 4395	.8760 9764	.8327 3928
3.40	.9837 9046	.9571 7537	.9237 3368	.8858 8805	.8453 5611
3.45	.9852 9315	.9609 5273	.9301 5305	.8950 6909	.8572 6116
3.50	.9866 7167	.9644 4296	.9361 2367	.9036 6154	.8684 6955
3.55	.9879 3471	.9676 6304	.9416 6723	.9116 8728	.8789 9890
3.60	.9890 9050	.9706 2944	.9468 0542	.9191 6912	.8888 6895
3.65	.9901 4682	.9733 5808	.9515 5974	.9261 3050	.8981 0126
3.70	.9911 1103	.9758 6431	.9559 5142	.9325 9532	.9067 1889
3.75	.9919 9006	.9781 6285	.9600 0129	.9385 8773	.9147 4609
3.80	.9927 9043	.9802 6784	.9637 2975	.9441 3192	.9222 0802
3.85	.9935 1827	.9821 9276	.9671 5662	.9492 5199	.9291 3049
3.90	.9941 7933	.9839 5045	.9703 0114	.9539 7179	.9355 3970
3.95	.9947 7899	.9855 5312	.9731 8187	.9583 1478	.9414 6205
4.00	.9953 2227	.9870 1234	.9758 1668	.9623 0393	.9469 2388
4.05	.9958 1385	.9883 3904	.9782 2271	.9659 6160	.9519 5134
4.10	.9962 5810	.9895 4354	.9804 1631	.9693 0948	.9565 7019
4.15	.9966 5907	.9906 3554	.9824 1308	.9723 6849	.9608 0569
4.20	.9970 2053	.9916 2413	.9842 2784	.9751 5878	.9646 8246
4.25	.9973 4597	.9925 1785	.9858 7459	.9776 9963	.9682 2438
4.30	.9976 3861	.9933 2467	.9873 6657	.9800 0944	.9714 5450
4.35	.9979 0142	.9940 5202	.9887 1626	.9821 0571	.9743 9498
4.40	.9981 3715	.9947 0680	.9899 3535	.9840 0503	.9770 6705
4.45	.9983 4833	.9952 9544	.9910 3480	.9857 2308	.9794 9094
4.50	.9985 3728	.9958 2389	.9920 2486	.9872 7464	.9816 8588
4.55	.9987 0613	.9962 9764	.9929 1507	.9886 7357	.9836 7006
4.60	.9988 5682	.9967 2177	.9937 1431	.9899 3286	.9854 6067
4.65	.9989 9115	.9971 0095	.9944 3080	.9910 6465	.9870 7384
4.70	.9991 1073	.9974 3949	.9950 7216	.9920 8024	.9885 2474
4.75	.9992 1706	.9977 4132	.9956 4543	.9929 9013	.9898 2752
4.80	.9993 1149	.9980 1007	.9961 5708	.9938 0406	.9909 9537
4.85	.9993 9523	.9982 4903	.9966 1308	.9945 3101	.9920 4056
4.90	.9994 6942	.9984 6122	.9970 1888	.9951 7929	.9929 7446
4.95	.9995 3505	.9986 4938	.9973 7950	.9957 5653	.9938 0758
5.00	.9995 9305	.9988 1601	.9976 9950	.9962 6973	.9945 4960

W_0	$P(W_0,2)$	$P(W_0,3)$	$P(W_0,4)$	$P(W_0,5)$	$P(W_0,6)$
5.05	.9996 4423	.9989 6337	.9979 8305	.9967 2530	.9952 0945
5.10	.9996 8934	.9990 9352	.9982 3395	.9971 2913	.9957 9531
5.15	.9997 2905	.9992 0831	.9984 5565	.9974 8654	.9963 1466
5.20	.9997 6397	.9993 0943	.9986 5126	.9978 0240	.9967 7433
5.25	.9997 9462	.9993 9837	.9988 2361	.9980 8115	.9971 8057
5.30	.9998 2151	.9994 7651	.9989 7526	.9983 2676	.9975 3904
5.35	.9998 4506	.9995 4507	.9991 0851	.9985 4288	.9978 5487
5.40	.9998 6567	.9996 0513	.9992 2543	.9987 3276	.9981 3271
5.45	.9998 8367	.9996 5769	.9993 2787	.9988 9936	.9983 7678
5.50	.9998 9938	.9997 0362	.9994 1751	.9990 4531	.9985 9086
5.55	.9999 1307	.9997 4370	.9994 9584	.9991 7299	.9987 7835
5.60	.9999 2499	.9997 7864	.9995 6419	.9992 8454	.9989 4231
5.65	.9999 3535	.9998 0905	.9996 2375	.9993 8185	.9990 8550
5.70	.9999 4434	.9998 3548	.9996 7559	.9994 6662	.9992 1035
5.75	.9999 5215	.9998 5843	.9997 2063	.9995 4036	.9993 1907
5.80	.9999 5890	.9998 7833	.9997 5973	.9996 0442	.9994 1360
5.85	.9999 6475	.9998 9556	.9997 9361	.9996 5999	.9994 9567
5.90	.9999 6980	.9999 1046	.9998 2294	.9997 0813	.9995 6682
5.95	.9999 7415	.9999 2333	.9998 4830	.9997 4978	.9996 2843
6.00	.9999 7791	.9999 3443	.9998 7018	.9997 8576	.9996 8169
6.05	.9999 8114	.9999 4399	.9998 8905	.9998 1680	.9997 2767
6.10	.9999 8392	.9999 5221	.9999 0529	.9998 4354	.9997 6731
6.15	.9999 8631	.9999 5928	.9999 1926	.9998 6655	.9998 0144
6.20	.9999 8835	.9999 6535	.9999 3125	.9998 8632	.9998 3078
6.25	.9999 9010	.9999 7054	.9999 4154	.9999 0329	.9998 5598
6.30	.9999 9160	.9999 7499	.9999 5035	.9999 1782	.9998 7758
6.35	.9999 9288	.9999 7880	.9999 5788	.9999 3027	.9998 9607
6.40	.9999 9397	.9999 8204	.9999 6432	.9999 4090	.9999 1188
6.45	.9999 9491	.9999 8481	.9999 6980	.9999 4997	.9999 2539
6.50	.9999 9570	.9999 8717	.9999 7448	.9999 5771	.9999 3690
6.55	.9999 9637	.9999 8917	.9999 7846	.9999 6429	.9999 4671
6.60	.9999 9694	.9999 9087	.9999 8184	.9999 6989	.9999 5505
6.65	.9999 9743	.9999 9232	.9999 8471	.9999 7464	.9999 6213
6.70	.9999 9784	.9999 9354	.9999 8714	.9999 7866	.9999 6813
6.75	.9999 9818	.9999 9458	.9999 8920	.9999 8208	.9999 7322
6.80	.9999 9848	.9999 9545	.9999 9094	.9999 8496	.9999 7753
6.85	.9999 9873	.9999 9619	.9999 9241	.9999 8740	.9999 8116
6.90	.9999 9893	.9999 9681	.9999 9365	.9999 8945	.9999 8423
6.95	.9999 9911	.9999 9734	.9999 9469	.9999 9118	.9999 8681
7.00	.9999 9926	.9999 9778	.9999 9557	.9999 9264	.9999 8899
7.05	.9999 9938	.9999 9815	.9999 9631	.9999 9386	.9999 9082
7.10	.9999 9948	.9999 9846	.9999 9692	.9999 9489	.9999 9235
7.15	.9999 9957	.9999 9872	.9999 9744	.9999 9575	.9999 9364
7.20	.9999 9964	.9999 9894	.9999 9788	.9999 9647	.9999 9471
7.25	.9999 9970	.9999 9912	.9999 9824	.9999 9707	.9999 9561
7.30	.9999 9976	.9999 9927	.9999 9854	.9999 9757	.9999 9636
7.35	.9999 9980	.9999 9939	.9999 9879	.9999 9799	.9999 9699
7.40	.9999 9983	.9999 9950	.9999 9900	.9999 9834	.9999 9751
7.45	.9999 9986	.9999 9959	.9999 9918	.9999 9863	.9999 9794
7.50	.9999 9989	.9999 9966	.9999 9932	.9999 9887	.9999 9830

W_0	$P(W_0,2)$	$P(W_0,3)$	$P(W_0,4)$	$P(W_0,5)$	$P(W_0,6)$
7.55	.9999 9991	.9999 9972	.9999 9944	.9999 9907	.9999 9860
7.60	.9999 9992	.9999 9977	.9999 9954	.9999 9923	.9999 9885
7.65	.9999 9994	.9999 9981	.9999 9962	.9999 9937	.9999 9906
7.70	.9999 9995	.9999 9984	.9999 9969	.9999 9948	.9999 9923
7.75	.9999 9996	.9999 9987	.9999 9975	.9999 9958	.9999 9937
7.80	.9999 9997	.9999 9990	.9999 9979	.9999 9965	.9999 9948
7.85	.9999 9997	.9999 9991	.9999 9983	.9999 9972	.9999 9958
7.90	.9999 9998	.9999 9993	.9999 9986	.9999 9977	.9999 9965
7.95	.9999 9998	.9999 9994	.9999 9989	.9999 9981	.9999 9972
8.00	.9999 9998	.9999 9995	.9999 9991	.9999 9985	.9999 9977
8.05	.9999 9999	.9999 9996	.9999 9992	.9999 9987	.9999 9981
8.10	.9999 9999	.9999 9997	.9999 9994	.9999 9990	.9999 9985
8.15	.9999 9999	.9999 9998	.9999 9995	.9999 9992	.9999 9988
8.20	.9999 9999	.9999 9998	.9999 9996	.9999 9993	.9999 9990
8.25	.9999 9999	.9999 9998	.9999 9997	.9999 9995	.9999 9992
8.30	1.0000 0000	.9999 9999	.9999 9997	.9999 9996	.9999 9993
8.35		.9999 9999	.9999 9998	.9999 9996	.9999 9995
8.40		.9999 9999	.9999 9998	.9999 9997	.9999 9996
8.45		.9999 9999	.9999 9999	.9999 9998	.9999 9997
8.50		.9999 9999	.9999 9999	.9999 9998	.9999 9997
8.55		1.0000 0000	.9999 9999	.9999 9999	.9999 9998
8.60			.9999 9999	.9999 9999	.9999 9998
8.65			.9999 9999	.9999 9999	.9999 9999
8.70			1.0000 0000	.9999 9999	.9999 9999
8.75				.9999 9999	.9999 9999
8.80				1.0000 0000	.9999 9999
8.85					.9999 9999
8.90					1.0000 0000
8.95					
9.00					
9.05					
9.10					
9.15					
9.20					
9.25					
9.30					
9.35					
9.40					
9.45					
9.50					
9.55					
9.60					
9.65					
9.70					
9.75					
9.80					
9.85					
9.90					
9.95					
10.00					

W_0	$P(W_0,7)$	$P(W_0,8)$	$P(W_0,9)$	$P(W_0,10)$	$P(W_0,11)$
0.05	.0000 0000				
0.10	.0000 0001	.0000 0000			
0.15	.0000 0012	.0000 0001			
0.20	.0000 0067	.0000 0006	.0000 0000		
0.25	.0000 0255	.0000 0027	.0000 0003	.0000 0000	
0.30	.0000 0755	.0000 0096	.0000 0012	.0000 0002	.0000 0000
0.35	.0000 1885	.0000 0280	.0000 0041	.0000 0006	.0000 0001
0.40	.0000 4150	.0000 0703	.0000 0118	.0000 0020	.0000 0003
0.45	.0000 8301	.0000 1579	.0000 0298	.0000 0056	.0000 0010
0.50	.0001 5384	.0000 3246	.0000 0679	.0000 0141	.0000 0029
0.55	.0002 6802	.0000 6206	.0000 1426	.0000 0326	.0000 0074
0.60	.0004 4357	.0001 1177	.0000 2794	.0000 0694	.0000 0172
0.65	.0007 0296	.0001 9137	.0000 5170	.0000 1388	.0000 0371
0.70	.0010 7339	.0003 1379	.0000 9103	.0000 2625	.0000 0753
0.75	.0015 8707	.0004 9557	.0001 5356	.0000 4729	.0000 1449
0.80	.0022 8123	.0007 5731	.0002 4949	.0000 8170	.0000 2662
0.85	.0031 9807	.0011 2411	.0003 9212	.0001 3596	.0000 4691
0.90	.0043 8459	.0016 2580	.0005 9828	.0002 1884	.0000 7966
0.95	.0058 9215	.0022 9720	.0008 8888	.0003 4189	.0001 3086
1.00	.0077 7599	.0031 7818	.0012 8923	.0005 1987	.0002 0862
1.05	.0100 9456	.0043 1353	.0018 2948	.0007 7133	.0003 2364
1.10	.0129 0870	.0057 5282	.0025 4474	.0011 1902	.0004 8972
1.15	.0162 8077	.0075 4993	.0034 7531	.0015 9034	.0007 2428
1.20	.0202 7363	.0097 6255	.0046 6657	.0022 1764	.0010 4886
1.25	.0249 4955	.0124 5149	.0061 6882	.0030 3848	.0014 8955
1.30	.0303 6916	.0156 7980	.0080 3697	.0040 9574	.0020 7743
1.35	.0365 9024	.0195 1184	.0103 2993	.0054 3752	.0028 4885
1.40	.0436 6665	.0240 1220	.0131 1003	.0071 1699	.0038 4562
1.45	.0516 4728	.0292 4455	.0164 4208	.0091 9194	.0051 1503
1.50	.0605 7496	.0352 7049	.0203 9247	.0117 2425	.0067 0972
1.55	.0704 8561	.0421 4826	.0250 2797	.0147 7909	.0086 8736
1.60	.0814 0740	.0499 3164	.0304 1463	.0184 2406	.0111 1018
1.65	.0933 6006	.0586 6870	.0366 1642	.0227 2806	.0140 4421
1.70	.1063 5434	.0684 0082	.0436 9400	.0277 6011	.0175 5842
1.75	.1203 9166	.0791 6161	.0517 0339	.0335 8806	.0217 2365
1.80	.1354 6386	.0909 7618	.0606 9472	.0402 7723	.0266 1140
1.85	.1515 5311	.1038 6031	.0707 1109	.0478 8897	.0322 9247
1.90	.1686 3210	.1178 2002	.0817 8742	.0564 7934	.0388 3558
1.95	.1866 6422	.1328 5116	.0939 4959	.0660 9777	.0463 0583
2.00	.2056 0401	.1489 3922	.1072 1361	.0767 8576	.0547 6325
2.05	.2253 9768	.1660 5940	.1215 8503	.0885 7585	.0642 6135
2.10	.2459 8384	.1841 7674	.1370 5856	.1014 9060	.0748 4575
2.15	.2672 9421	.2032 4650	.1536 1786	.1155 4185	.0865 5291
2.20	.2892 5450	.2232 1475	.1712 3554	.1307 3011	.0994 0909
2.25	.3117 8538	.2440 1896	.1898 7340	.1470 4427	.1134 2941
2.30	.3348 0343	.2655 8890	.2094 8282	.1644 6144	.1286 1718
2.35	.3582 2215	.2878 4752	.2300 0537	.1829 4706	.1449 6346
2.40	.3819 5300	.3107 1195	.2513 7357	.2024 5523	.1624 4689
2.45	.4059 0641	.3340 9462	.2735 1179	.2229 2930	.1810 3369
2.50	.4299 9275	.3579 0434	.2963 3732	.2443 0256	.2006 7801

W_0	$P(W_0, .7)$	$P(W_0, .8)$	$P(W_0, .9)$	$P(W_0, .10)$	$P(W_0, .11)$
2.55	.4541 2332	.3820 4749	.3197 6144	.2664 9916	.2213 2246
2.60	.4782 1118	.4064 2909	.3436 9068	.2894 3522	.2428 9885
2.65	.5021 7206	.4309 5397	.3680 2800	.3130 1996	.2653 2919
2.70	.5259 2502	.4555 2780	.3926 7410	.3371 5703	.2885 2679
2.75	.5493 9318	.4800 5813	.4175 2862	.3617 4580	.3123 9751
2.80	.5725 0429	.5044 5527	.4424 9138	.3866 8275	.3368 4117
2.85	.5951 9119	.5286 3322	.4674 6355	.4118 6283	.3617 5294
2.90	.6173 9222	.5525 1035	.4923 4867	.4371 8078	.3870 2485
2.95	.6390 5153	.5760 1007	.5170 5373	.4625 3244	.4125 4724
3.00	.6601 1925	.5990 6139	.5414 8998	.4878 1593	.4382 1022
3.05	.6805 5165	.6215 9933	.5655 7378	.5129 3276	.4639 0505
3.10	.7003 1116	.6435 6526	.5892 2720	.5377 8886	.4895 2542
3.15	.7193 6635	.6649 0712	.6123 7861	.5622 9541	.5149 6869
3.20	.7376 9179	.6855 7955	.6349 6306	.5863 6962	.5401 3692
3.25	.7552 6788	.7055 4391	.6569 2260	.6099 3534	.5649 3784
3.30	.7720 8068	.7247 6820	.6782 0646	.6329 2349	.5892 8563
3.35	.7881 2156	.7432 2697	.6987 7111	.6552 7248	.6131 0156
3.40	.8033 8694	.7609 0107	.7185 8023	.6769 2834	.6363 1450
3.45	.8178 7794	.7777 7740	.7376 0462	.6978 4486	.6588 6127
3.50	.8315 9999	.7938 4860	.7558 2194	.7179 8356	.6806 8682
3.55	.8445 6248	.8091 1264	.7732 1649	.7373 1353	.7017 4434
3.60	.8567 7832	.8235 7251	.7897 7883	.7558 1124	.7219 9519
3.65	.8682 6361	.8372 3570	.8055 0541	.7734 6023	.7414 0874
3.70	.8790 3719	.8501 1386	.8203 9816	.7902 5072	.7599 6212
3.75	.8891 2028	.8622 2230	.8344 6400	.8061 7923	.7776 3985
3.80	.8985 3609	.8735 7955	.8477 1437	.8212 4807	.7944 3348
3.85	.9073 0948	.8842 0698	.8601 6479	.8354 6486	.8103 4106
3.90	.9154 6661	.8941 2828	.8718 3431	.8488 4202	.8253 6663
3.95	.9230 3459	.9033 6913	.8827 4505	.8613 9622	.8395 1973
4.00	.9300 4123	.9119 5679	.8929 2176	.8731 4787	.8528 1478
4.05	.9365 1474	.9199 1969	.9023 9133	.8841 2058	.8652 7051
4.10	.9424 8344	.9272 8714	.9111 8237	.8943 4067	.8769 0945
4.15	.9479 7564	.9340 8899	.9193 2480	.9038 3666	.8877 5729
4.20	.9530 1930	.9403 5533	.9268 4948	.9126 3882	.8978 4239
4.25	.9576 4197	.9461 1625	.9337 8788	.9207 7874	.9071 9526
4.30	.9618 7058	.9514 0160	.9401 7169	.9282 8892	.9158 4806
4.35	.9657 3132	.9562 4079	.9460 3264	.9352 0238	.9238 3417
4.40	.9692 4951	.9606 6259	.9514 0215	.9415 5238	.9311 8772
4.45	.9724 4957	.9646 9501	.9563 1118	.9473 7204	.9379 4329
4.50	.9753 5488	.9683 6516	.9607 8999	.9526 9417	.9441 3549
4.55	.9779 8777	.9716 9916	.9648 6801	.9575 5097	.9497 9870
4.60	.9803 6948	.9747 2202	.9685 7368	.9619 7385	.9549 6682
4.65	.9825 2012	.9774 5762	.9719 3437	.9659 9328	.9596 7298
4.70	.9844 5867	.9799 2868	.9749 7627	.9696 3865	.9639 4942
4.75	.9862 0300	.9821 5667	.9777 2433	.9729 3815	.9678 2729
4.80	.9877 6984	.9841 6186	.9802 0223	.9759 1871	.9713 3651
4.85	.9891 7484	.9859 6330	.9824 3235	.9786 0590	.9745 0571
4.90	.9904 3258	.9875 7880	.9844 3575	.9810 2395	.9773 6214
4.95	.9915 5660	.9890 2503	.9862 3220	.9831 9570	.9799 3160
5.00	.9925 5944	.9903 1747	.9878 4016	.9851 4256	.9822 3844

W_0	$P(W_0, .7)$	$P(W_0, .8)$	$P(W_0, .9)$	$P(W_0, .10)$	$P(W_0, .11)$
5.05	.9934 5269	.9914 7048	.9892 7685	.9868 8461	.9843 0555
5.10	.9942 4702	.9924 9736	.9905 5823	.9884 4054	.9861 5433
5.15	.9949 5224	.9934 1036	.9916 9911	.9898 2773	.9878 0478
5.20	.9955 7734	.9942 2076	.9927 1312	.9910 6227	.9892 7545
5.25	.9961 3054	.9949 3890	.9936 1285	.9921 5901	.9905 8354
5.30	.9966 1933	.9955 7423	.9944 0981	.9931 3164	.9917 4494
5.35	.9970 5053	.9961 3540	.9951 1456	.9939 9272	.9927 7426
5.40	.9974 3033	.9966 3025	.9957 3673	.9947 5373	.9936 8493
5.45	.9977 6435	.9970 6594	.9962 8510	.9954 2517	.9944 8922
5.50	.9980 5765	.9974 4892	.9967 6764	.9960 1658	.9951 9834
5.55	.9983 1480	.9977 8505	.9971 9155	.9965 3664	.9958 2248
5.60	.9985 3992	.9980 7959	.9975 6337	.9969 9321	.9963 7091
5.65	.9987 3670	.9983 3729	.9978 8899	.9973 9339	.9968 5201
5.70	.9989 0845	.9985 6241	.9981 7368	.9977 4357	.9972 7334
5.75	.9990 5813	.9987 5878	.9984 2221	.9980 4952	.9976 4174
5.80	.9991 8838	.9989 2980	.9986 3883	.9983 1639	.9979 6332
5.85	.9993 0156	.9990 7853	.9988 2736	.9985 4881	.9982 4358
5.90	.9993 9977	.9992 0767	.9989 9117	.9987 5091	.9984 8746
5.95	.9994 8485	.9993 1963	.9991 3331	.9989 2638	.9986 9933
6.00	.9995 5847	.9994 1657	.9992 5644	.9990 7848	.9988 8310
6.05	.9996 2207	.9995 0037	.9993 6295	.9992 1014	.9990 4227
6.10	.9996 7693	.9995 7271	.9994 5495	.9993 2393	.9991 7990
6.15	.9997 2420	.9996 3507	.9995 3430	.9994 2212	.9992 9874
6.20	.9997 6485	.9996 8874	.9996 0264	.9995 0673	.9994 0119
6.25	.9997 9978	.9997 3487	.9996 6140	.9995 7952	.9994 8938
6.30	.9998 2974	.9997 7446	.9997 1186	.9996 4206	.9995 6517
6.35	.9998 5541	.9998 0840	.9997 5513	.9996 9571	.9996 3023
6.40	.9998 7737	.9998 3744	.9997 9218	.9997 4167	.9996 8598
6.45	.9998 9613	.9998 6226	.9998 2386	.9997 8098	.9997 3368
6.50	.9999 1213	.9998 8344	.9998 5090	.9998 1455	.9997 7445
6.55	.9999 2576	.9999 0150	.9998 7396	.9998 4319	.9998 0923
6.60	.9999 3736	.9999 1686	.9998 9360	.9998 6758	.9998 3886
6.65	.9999 4721	.9999 2992	.9999 1029	.9998 8833	.9998 6407
6.70	.9999 5557	.9999 4101	.9999 2446	.9999 0595	.9998 8549
6.75	.9999 6266	.9999 5040	.9999 3648	.9999 2089	.9999 0367
6.80	.9999 6865	.9999 5836	.9999 4665	.9999 3355	.9999 1906
6.85	.9999 7372	.9999 6508	.9999 5525	.9999 4425	.9999 3209
6.90	.9999 7799	.9999 7075	.9999 6252	.9999 5329	.9999 4309
6.95	.9999 8160	.9999 7554	.9999 6864	.9999 6092	.9999 5237
7.00	.9999 8463	.9999 7956	.9999 7380	.9999 6734	.9999 6019
7.05	.9999 8718	.9999 8295	.9999 7814	.9999 7274	.9999 6677
7.10	.9999 8932	.9999 8579	.9999 8178	.9999 7728	.9999 7230
7.15	.9999 9111	.9999 8818	.9999 8484	.9999 8109	.9999 7694
7.20	.9999 9261	.9999 9017	.9999 8739	.9999 8428	.9999 8082
7.25	.9999 9387	.9999 9184	.9999 8953	.9999 8695	.9999 8408
7.30	.9999 9492	.9999 9324	.9999 9132	.9999 8917	.9999 8679
7.35	.9999 9579	.9999 9440	.9999 9281	.9999 9103	.9999 8906
7.40	.9999 9652	.9999 9537	.9999 9406	.9999 9258	.9999 9095
7.45	.9999 9713	.9999 9618	.9999 9509	.9999 9387	.9999 9252
7.50	.9999 9763	.9999 9685	.9999 9595	.9999 9495	.9999 9383

W_0	$P(W_0,7)$	$P(W_0,8)$	$P(W_0,9)$	$P(W_0,10)$	$P(W_0,11)$
7.55	.9999 9805	.9999 9740	.9999 9666	.9999 9583	.9999 9492
7.60	.9999 9839	.9999 9786	.9999 9725	.9999 9657	.9999 9582
7.65	.9999 9868	.9999 9824	.9999 9774	.9999 9718	.9999 9656
7.70	.9999 9892	.9999 9856	.9999 9815	.9999 9769	.9999 9718
7.75	.9999 9911	.9999 9882	.9999 9848	.9999 9810	.9999 9768
7.80	.9999 9927	.9999 9903	.9999 9876	.9999 9845	.9999 9810
7.85	.9999 9941	.9999 9921	.9999 9898	.9999 9873	.9999 9845
7.90	.9999 9951	.9999 9935	.9999 9917	.9999 9896	.9999 9873
7.95	.9999 9960	.9999 9947	.9999 9932	.9999 9915	.9999 9897
8.00	.9999 9968	.9999 9957	.9999 9945	.9999 9931	.9999 9916
8.05	.9999 9974	.9999 9965	.9999 9955	.9999 9944	.9999 9931
8.10	.9999 9979	.9999 9972	.9999 9963	.9999 9954	.9999 9944
8.15	.9999 9983	.9999 9977	.9999 9970	.9999 9963	.9999 9955
8.20	.9999 9986	.9999 9981	.9999 9976	.9999 9970	.9999 9963
8.25	.9999 9989	.9999 9985	.9999 9981	.9999 9976	.9999 9970
8.30	.9999 9991	.9999 9988	.9999 9984	.9999 9980	.9999 9976
8.35	.9999 9993	.9999 9990	.9999 9987	.9999 9984	.9999 9981
8.40	.9999 9994	.9999 9992	.9999 9990	.9999 9987	.9999 9984
8.45	.9999 9995	.9999 9994	.9999 9992	.9999 9990	.9999 9987
8.50	.9999 9996	.9999 9995	.9999 9993	.9999 9992	.9999 9990
8.55	.9999 9997	.9999 9996	.9999 9995	.9999 9993	.9999 9992
8.60	.9999 9997	.9999 9997	.9999 9996	.9999 9995	.9999 9993
8.65	.9999 9998	.9999 9997	.9999 9997	.9999 9996	.9999 9995
8.70	.9999 9998	.9999 9998	.9999 9997	.9999 9997	.9999 9996
8.75	.9999 9999	.9999 9998	.9999 9998	.9999 9997	.9999 9997
8.80	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9997
8.85	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9998
8.90	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
8.95	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.00	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.05		1.0000 0000	.9999 9999	.9999 9999	.9999 9999
9.10			1.0000 0000	.9999 9999	.9999 9999
9.15				1.0000 0000	.9999 9999
9.20					1.0000 0000
9.25					
9.30					
9.35					
9.40					
9.45					
9.50					
9.55					
9.60					
9.65					
9.70					
9.75					
9.80					
9.85					
9.90					
9.95					
10.00					

W_0	$P(W_0, 12)$	$P(W_0, 13)$	$P(W_0, 14)$	$P(W_0, 15)$	$P(W_0, 16)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35	.0000 0000				
0.40	.0000 0001				
0.45	.0000 0002	.0000 0000			
0.50	.0000 0006	.0000 0001	.0000 0000		
0.55	.0000 0017	.0000 0004	.0000 0001	.0000 0000	
0.60	.0000 0042	.0000 0010	.0000 0003	.0000 0001	
0.65	.0000 0099	.0000 0026	.0000 0007	.0000 0002	.0000 0000
0.70	.0000 0215	.0000 0061	.0000 0017	.0000 0005	.0000 0001
0.75	.0000 0442	.0000 0135	.0000 0041	.0000 0012	.0000 0004
0.80	.0000 0864	.0000 0279	.0000 0090	.0000 0029	.0000 0009
0.85	.0000 1612	.0000 0552	.0000 0189	.0000 0064	.0000 0022
0.90	.0000 2888	.0000 1043	.0000 0376	.0000 0135	.0000 0048
0.95	.0000 4989	.0000 1895	.0000 0718	.0000 0271	.0000 0102
1.00	.0000 8338	.0000 3321	.0000 1319	.0000 0523	.0000 0207
1.05	.0001 3525	.0000 5633	.0000 2339	.0000 0969	.0000 0401
1.10	.0002 1346	.0000 9274	.0000 4017	.0000 1736	.0000 0748
1.15	.0003 2855	.0001 4854	.0000 6696	.0000 3011	.0000 1351
1.20	.0004 9411	.0002 3200	.0001 0862	.0000 5073	.0000 2364
1.25	.0007 2735	.0003 5399	.0001 7179	.0000 8317	.0000 4018
1.30	.0010 4959	.0005 2854	.0002 6541	.0001 3295	.0000 6646
1.35	.0014 8678	.0007 7339	.0004 0117	.0002 0759	.0001 0719
1.40	.0020 6993	.0011 1052	.0005 9413	.0003 1709	.0001 6887
1.45	.0028 3542	.0015 6666	.0008 6322	.0004 7449	.0002 6026
1.50	.0038 2527	.0021 7378	.0012 3187	.0006 9643	.0003 9289
1.55	.0050 8719	.0029 6942	.0017 2850	.0010 0376	.0005 8168
1.60	.0066 7449	.0039 9694	.0023 8698	.0014 2213	.0008 4552
1.65	.0086 4580	.0053 0561	.0032 4701	.0019 8247	.0012 0791
1.70	.0110 6458	.0069 5050	.0043 5435	.0027 2152	.0016 9749
1.75	.0139 9841	.0089 9221	.0057 6087	.0036 8212	.0023 4866
1.80	.0175 1811	.0114 9633	.0075 2443	.0049 1341	.0032 0193
1.85	.0216 9666	.0145 3275	.0097 0854	.0064 7086	.0043 0423
1.90	.0266 0789	.0181 7465	.0123 8175	.0084 1603	.0057 0905
1.95	.0323 2513	.0224 9738	.0156 1686	.0108 1614	.0074 7634
2.00	.0389 1969	.0275 7713	.0194 8987	.0137 4340	.0096 7216
2.05	.0464 5929	.0334 8944	.0240 7874	.0172 7403	.0123 6815
2.10	.0550 0648	.0403 0759	.0294 6193	.0214 8713	.0156 4062
2.15	.0646 1709	.0481 0092	.0357 1678	.0264 6325	.0195 6952
2.20	.0753 3876	.0569 3324	.0429 1784	.0322 8282	.0242 3702
2.25	.0872 0961	.0668 6107	.0511 3511	.0390 2444	.0297 2601
2.30	.1002 5705	.0779 3221	.0604 3224	.0467 6301	.0361 1830
2.35	.1144 9682	.0901 8426	.0708 6486	.0555 6791	.0434 9279
2.40	.1299 3222	.1036 4342	.0824 7897	.0655 0115	.0519 2350
2.45	.1465 5368	.1183 2351	.0953 0949	.0766 1560	.0614 7765
2.50	.1643 3851	.1342 2520	.1093 7908	.0889 5339	.0722 1376

W_0	$P(W_0,.12)$	$P(W_0,.13)$	$P(W_0,.14)$	$P(W_0,.15)$	$P(W_0,.16)$
2.55	.1832 5098	.1513 3557	.1246 9713	.1025 4453	.0841 7985
2.60	.2032 4264	.1696 2794	.1412 5910	.1174 0566	.0974 1192
2.65	.2242 5291	.1890 6199	.1590 4613	.1335 3926	.1119 3259
2.70	.2462 0992	.2095 8420	.1780 2500	.1509 3303	.1277 5001
2.75	.2690 3154	.2311 2848	.1981 4835	.1695 5969	.1448 5720
2.80	.2926 2660	.2536 1720	.2193 5527	.1893 7705	.1632 3164
2.85	.3168 9628	.2769 6229	.2415 7213	.2103 2849	.1828 3523
2.90	.3417 3554	.3010 6660	.2647 1369	.2323 4371	.2036 1468
2.95	.3670 3473	.3258 2542	.2886 8441	.2553 3975	.2255 0216
3.00	.3926 8111	.3511 2806	.3133 7999	.2792 2233	.2484 1632
3.05	.4185 6047	.3768 5954	.3386 8898	.3038 8734	.2722 6355
3.10	.4445 5866	.4029 0225	.3644 9453	.3292 2253	.2969 3955
3.15	.4705 6305	.4291 3764	.3906 7619	.3551 0931	.3223 3103
3.20	.4964 6389	.4554 4780	.4171 1165	.3814 2463	.3483 1757
3.25	.5221 5559	.4817 1706	.4436 7855	.4080 4286	.3747 7357
3.30	.5475 3782	.5078 3333	.4702 5607	.4348 3763	.4015 7025
3.35	.5725 1647	.5336 8938	.4967 2656	.4616 8365	.4285 7760
3.40	.5970 0446	.5591 8403	.5229 7689	.4884 5840	.4556 6630
3.45	.6209 2240	.5842 2300	.5488 9975	.5150 4362	.4827 0950
3.50	.6441 9904	.6087 1976	.5743 9472	.5413 2677	.5095 8450
3.55	.6667 7159	.6325 9612	.5993 6917	.5672 0214	.5361 7420
3.60	.6885 8594	.6557 8260	.6237 3896	.5925 7194	.5623 6846
3.65	.7095 9661	.6782 1879	.6474 2895	.6173 4701	.5880 6511
3.70	.7297 6672	.6998 5332	.6703 7336	.6414 4751	.6131 7090
3.75	.7490 6774	.7206 4395	.6925 1593	.6648 0323	.6376 0212
3.80	.7674 7916	.7405 5728	.7138 0989	.6873 5389	.6612 8506
3.85	.7849 8812	.7595 6852	.7342 1783	.7090 4909	.6841 5626
3.90	.8015 8891	.7776 6107	.7537 1145	.7298 4826	.7061 6260
3.95	.8172 8244	.7948 2605	.7722 7113	.7497 2036	.7272 6112
4.00	.8320 7570	.8110 6176	.7898 8547	.7686 4348	.7474 1884
4.05	.8459 8113	.8263 7311	.8065 5075	.7866 0438	.7666 1230
4.10	.8590 1605	.8407 7095	.8222 7028	.8035 9791	.7848 2708
4.15	.8712 0200	.8542 7145	.8370 5377	.8196 2634	.8020 5721
4.20	.8825 6418	.8668 9548	.8509 1666	.8346 9872	.8183 0450
4.25	.8931 3085	.8786 6791	.8638 7941	.8488 3015	.8335 7780
4.30	.9029 3273	.8896 1701	.8759 6684	.8620 4106	.8478 9231
4.35	.9120 0254	.8997 7385	.8872 0743	.8743 5647	.8612 6876
4.40	.9203 7443	.9091 7171	.8976 3272	.8858 0531	.8737 3271
4.45	.9280 8358	.9178 4555	.9072 7664	.8964 1975	.8853 1376
4.50	.9351 6571	.9258 3148	.9161 7499	.9062 3451	.8960 4488
4.55	.9416 5677	.9331 6636	.9243 6484	.9152 8626	.9059 6170
4.60	.9475 9256	.9398 8732	.9318 8412	.9236 1309	.9151 0187
4.65	.9530 0844	.9460 3146	.9387 7109	.9312 5395	.9235 0450
4.70	.9579 3908	.9516 3546	.9450 6403	.9382 4821	.9312 0959
4.75	.9624 1826	.9567 3535	.9508 0083	.9446 3523	.9382 5755
4.80	.9664 7865	.9613 6624	.9560 1871	.9504 5401	.9446 8877
4.85	.9701 5170	.9655 6216	.9607 5400	.9557 4285	.9505 4325
4.90	.9734 6750	.9693 5585	.9650 4186	.9605 3911	.9558 6026
4.95	.9764 5471	.9727 7867	.9689 1617	.9648 7896	.9606 7805
5.00	.9791 4050	.9758 6050	.9724 0936	.9687 9725	.9650 3368

W_0	$P(W_0+.12)$	$P(W_0+.13)$	$P(W_0+.14)$	$P(W_0+.15)$	$P(W_0+.16)$
5.05	.9815 5053	.9786 2966	.9755 5232	.9723 2728	.9689 6276
5.10	.9837 0890	.9811 1289	.9783 7434	.9755 0081	.9724 9935
5.15	.9856 3818	.9833 3530	.9809 0305	.9783 4788	.9756 7586
5.20	.9873 5940	.9853 2042	.9831 6439	.9808 9683	.9785 2294
5.25	.9888 9215	.9870 9018	.9851 8265	.9831 7427	.9810 6947
5.30	.9902 5453	.9886 6495	.9869 8046	.9852 0507	.9833 4255
5.35	.9914 6328	.9900 6360	.9885 7883	.9870 1238	.9853 6746
5.40	.9925 3378	.9913 0352	.9899 9720	.9886 1769	.9871 6773
5.45	.9934 8017	.9924 0073	.9912 5348	.9900 4086	.9887 6517
5.50	.9943 1535	.9933 6990	.9923 6416	.9913 0018	.9901 7991
5.55	.9950 5111	.9942 2445	.9933 4432	.9924 1244	.9914 3046
5.60	.9956 9818	.9949 7661	.9942 0775	.9933 9302	.9925 3382
5.65	.9962 6627	.9956 3750	.9949 6699	.9942 5594	.9935 0552
5.70	.9967 6418	.9962 1719	.9956 3345	.9950 1397	.9943 5971
5.75	.9971 9985	.9967 2480	.9962 1745	.9956 7867	.9951 0924
5.80	.9975 8044	.9971 6853	.9967 2832	.9962 6052	.9957 6578
5.85	.9979 1236	.9975 5578	.9971 7446	.9967 6896	.9963 3986
5.90	.9982 0137	.9978 9319	.9975 6340	.9972 1250	.9968 4095
5.95	.9984 5262	.9981 8668	.9979 0193	.9975 9877	.9972 7759
6.00	.9986 7068	.9984 4156	.9981 9609	.9979 3461	.9976 5742
6.05	.9988 5964	.9986 6255	.9984 5128	.9982 2610	.9979 8728
6.10	.9990 2313	.9988 5386	.9986 7231	.9984 7871	.9982 7327
6.15	.9991 6437	.9990 1920	.9988 6343	.9986 9724	.9985 2081
6.20	.9992 8619	.9991 6189	.9990 2845	.9988 8601	.9987 3472
6.25	.9993 9110	.9992 8483	.9991 7069	.9990 4880	.9989 1928
6.30	.9994 8132	.9993 9059	.9992 9311	.9991 8896	.9990 7825
6.35	.9995 5878	.9994 8144	.9993 9831	.9993 0946	.9992 1497
6.40	.9996 2519	.9995 5936	.9994 8858	.9994 1289	.9993 3237
6.45	.9996 8204	.9996 2609	.9995 6591	.9995 0153	.9994 3302
6.50	.9997 3063	.9996 8315	.9996 3206	.9995 7738	.9995 1917
6.55	.9997 7211	.9997 3187	.9996 8856	.9996 4219	.9995 9281
6.60	.9998 0746	.9997 7341	.9997 3674	.9996 9748	.9996 5565
6.65	.9998 3755	.9998 0878	.9997 7778	.9997 4458	.9997 0920
6.70	.9998 6312	.9998 3884	.9998 1267	.9997 8464	.9997 5476
6.75	.9998 8482	.9998 6436	.9998 4230	.9998 1867	.9997 9347
6.80	.9999 0320	.9998 8599	.9998 6743	.9998 4753	.9998 2630
6.85	.9999 1876	.9999 0430	.9998 8870	.9998 7197	.9998 5412
6.90	.9999 3191	.9999 1977	.9999 0668	.9998 9263	.9998 7765
6.95	.9999 4301	.9999 3284	.9999 2186	.9999 1008	.9998 9752
7.00	.9999 5236	.9999 4385	.9999 3466	.9999 2480	.9999 1428
7.05	.9999 6023	.9999 5311	.9999 4543	.9999 3719	.9999 2839
7.10	.9999 6684	.9999 6090	.9999 5449	.9999 4761	.9999 4026
7.15	.9999 7239	.9999 6744	.9999 6210	.9999 5636	.9999 5023
7.20	.9999 7704	.9999 7292	.9999 6847	.9999 6369	.9999 5859
7.25	.9999 8093	.9999 7751	.9999 7381	.9999 6984	.9999 6559
7.30	.9999 8418	.9999 8134	.9999 7827	.9999 7497	.9999 7145
7.35	.9999 8690	.9999 8454	.9999 8199	.9999 7926	.9999 7634
7.40	.9999 8916	.9999 8721	.9999 8510	.9999 8284	.9999 8041
7.45	.9999 9104	.9999 8943	.9999 8769	.9999 8581	.9999 8381
7.50	.9999 9261	.9999 9128	.9999 8984	.9999 8829	.9999 8664

W_0	$P(W_0,12)$	$P(W_0,13)$	$P(W_0,14)$	$P(W_0,15)$	$P(W_0,16)$
7.55	.9999 9391	.9999 9281	.9999 9162	.9999 9035	.9999 8898
7.60	.9999 9499	.9999 9408	.9999 9310	.9999 9205	.9999 9093
7.65	.9999 9588	.9999 9513	.9999 9433	.9999 9346	.9999 9254
7.70	.9999 9662	.9999 9600	.9999 9534	.9999 9463	.9999 9387
7.75	.9999 9722	.9999 9672	.9999 9618	.9999 9560	.9999 9497
7.80	.9999 9773	.9999 9732	.9999 9687	.9999 9639	.9999 9588
7.85	.9999 9814	.9999 9780	.9999 9744	.9999 9705	.9999 9663
7.90	.9999 9848	.9999 9821	.9999 9791	.9999 9759	.9999 9725
7.95	.9999 9876	.9999 9854	.9999 9829	.9999 9803	.9999 9775
8.00	.9999 9899	.9999 9881	.9999 9861	.9999 9840	.9999 9817
8.05	.9999 9918	.9999 9903	.9999 9887	.9999 9870	.9999 9851
8.10	.9999 9933	.9999 9921	.9999 9908	.9999 9894	.9999 9879
8.15	.9999 9946	.9999 9936	.9999 9925	.9999 9914	.9999 9902
8.20	.9999 9956	.9999 9948	.9999 9939	.9999 9930	.9999 9920
8.25	.9999 9964	.9999 9958	.9999 9951	.9999 9943	.9999 9935
8.30	.9999 9971	.9999 9966	.9999 9960	.9999 9954	.9999 9948
8.35	.9999 9977	.9999 9973	.9999 9968	.9999 9963	.9999 9958
8.40	.9999 9981	.9999 9978	.9999 9974	.9999 9970	.9999 9966
8.45	.9999 9985	.9999 9982	.9999 9979	.9999 9976	.9999 9973
8.50	.9999 9988	.9999 9986	.9999 9983	.9999 9981	.9999 9978
8.55	.9999 9990	.9999 9988	.9999 9987	.9999 9984	.9999 9982
8.60	.9999 9992	.9999 9991	.9999 9989	.9999 9988	.9999 9986
8.65	.9999 9994	.9999 9993	.9999 9991	.9999 9990	.9999 9989
8.70	.9999 9995	.9999 9994	.9999 9993	.9999 9992	.9999 9991
8.75	.9999 9996	.9999 9995	.9999 9994	.9999 9994	.9999 9993
8.80	.9999 9997	.9999 9996	.9999 9996	.9999 9995	.9999 9994
8.85	.9999 9997	.9999 9997	.9999 9996	.9999 9996	.9999 9995
8.90	.9999 9998	.9999 9998	.9999 9997	.9999 9997	.9999 9996
8.95	.9999 9998	.9999 9998	.9999 9998	.9999 9997	.9999 9997
9.00	.9999 9999	.9999 9998	.9999 9998	.9999 9998	.9999 9998
9.05	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9998
9.10	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.15	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.20	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.25	1.0000 0000	1.0000 0000	.9999 9999	.9999 9999	.9999 9999
9.30			1.0000 0000	.9999 9999	.9999 9999
9.35				1.0000 0000	1.0000 0000
9.40					
9.45					
9.50					
9.55					
9.60					
9.65					
9.70					
9.75					
9.80					
9.85					
9.90					
9.95					
10.00					

W_0	$P(W_0,17)$	$P(W_0,18)$	$P(W_0,19)$	$P(W_0,20)$	$P(W_0,22)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70	.0000 0000				
0.75	.0000 0001	.0000 0000			
0.80	.0000 0003	.0000 0001	.0000 0000		
0.85	.0000 0007	.0000 0003	.0000 0001	.0000 0000	
0.90	.0000 0017	.0000 0006	.0000 0002	.0000 0001	
0.95	.0000 0039	.0000 0014	.0000 0005	.0000 0002	.0000 0000
1.00	.0000 0082	.0000 0032	.0000 0013	.0000 0005	.0000 0001
1.05	.0000 0165	.0000 0068	.0000 0028	.0000 0012	.0000 0002
1.10	.0000 0322	.0000 0138	.0000 0059	.0000 0025	.0000 0005
1.15	.0000 0605	.0000 0271	.0000 0121	.0000 0054	.0000 0011
1.20	.0000 1100	.0000 0511	.0000 0237	.0000 0110	.0000 0023
1.25	.0000 1937	.0000 0933	.0000 0448	.0000 0215	.0000 0049
1.30	.0000 3316	.0000 1651	.0000 0821	.0000 0408	.0000 0100
1.35	.0000 5524	.0000 2843	.0000 1460	.0000 0749	.0000 0197
1.40	.0000 8977	.0000 4764	.0000 2525	.0000 1336	.0000 0373
1.45	.0001 4249	.0000 7788	.0000 4251	.0000 2317	.0000 0686
1.50	.0002 2124	.0001 2438	.0000 6982	.0000 3914	.0000 1226
1.55	.0003 3647	.0001 9431	.0001 1205	.0000 6453	.0000 2133
1.60	.0005 0179	.0002 9731	.0001 7590	.0001 0393	.0000 3616
1.65	.0007 3463	.0004 4606	.0002 7046	.0001 6377	.0000 5984
1.70	.0010 5686	.0006 5694	.0004 0776	.0002 5277	.0000 9680
1.75	.0014 9541	.0009 5061	.0006 0342	.0003 8254	.0001 5322
1.80	.0020 8287	.0013 5275	.0008 7731	.0005 6824	.0002 3758
1.85	.0028 5795	.0018 9463	.0012 5423	.0008 2923	.0003 6125
1.90	.0038 6591	.0026 1370	.0017 6459	.0011 8982	.0005 3913
1.95	.0051 5872	.0035 5398	.0024 4500	.0016 7993	.0007 9044
2.00	.0067 9509	.0047 6641	.0033 3874	.0023 3575	.0011 3939
2.05	.0088 4023	.0063 0888	.0044 9614	.0032 0025	.0016 1599
2.10	.0113 6538	.0082 4610	.0059 7470	.0043 2359	.0022 5672
2.15	.0144 4700	.0106 4917	.0078 3900	.0057 6330	.0031 0511
2.20	.0181 6579	.0135 9488	.0101 6034	.0075 8421	.0042 1222
2.25	.0226 0533	.0171 6472	.0130 1607	.0098 5817	.0056 3684
2.30	.0278 5055	.0214 4361	.0164 8863	.0126 6336	.0074 4553
2.35	.0339 8596	.0265 1832	.0206 6429	.0160 8338	.0097 1227
2.40	.0410 9378	.0324 7573	.0256 3158	.0202 0595	.0125 1783
2.45	.0492 5185	.0394 0085	.0314 7953	.0251 2137	.0159 4881
2.50	.0585 3169	.0473 7477	.0382 9560	.0309 2064	.0200 9629

W_0	$P(W_0,17)$	$P(W_0,18)$	$P(W_0,19)$	$P(W_0,20)$	$P(W_0,22)$
2.55	.0689 9638	.0564 7249	.0461 6360	.0376 9344	.0250 5418
2.60	.0806 9876	.0667 6085	.0551 6145	.0455 2591	.0309 1727
2.65	.0936 7965	.0782 9649	.0653 5895	.0544 9832	.0377 7903
2.70	.1079 6638	.0911 2402	.0768 1573	.0646 8282	.0457 2922
2.75	.1235 7161	.1052 7438	.0895 7920	.0761 4119	.0548 5146
2.80	.1404 9244	.1207 6358	.1036 8292	.0889 2281	.0652 2073
2.85	.1587 0994	.1375 9165	.1191 4514	.1030 6287	.0769 0104
2.90	.1781 8902	.1557 4213	.1359 6773	.1185 8083	.0899 4317
2.95	.1988 7867	.1751 8178	.1541 3555	.1354 7934	.1043 8281
3.00	.2207 1263	.1958 6088	.1736 1619	.1537 4353	.1202 3892
3.05	.2436 1032	.2177 1375	.1943 6012	.1733 4071	.1375 1262
3.10	.2674 7819	.2406 5977	.2163 0131	.1942 2053	.1561 8639
3.15	.2922 1119	.2646 0464	.2393 5819	.2163 1564	.1762 2390
3.20	.3176 9459	.2894 4200	.2634 3497	.2395 4264	.1975 7020
3.25	.3438 0593	.3150 5524	.2884 2334	.2638 0351	.2201 5246
3.30	.3704 1697	.3413 1950	.3142 0428	.2889 8728	.2438 8111
3.35	.3973 9587	.3681 0377	.3406 5018	.3149 7206	.2686 5138
3.40	.4246 0916	.3952 7309	.3676 2705	.3416 2712	.2943 4524
3.45	.4519 2381	.4226 9067	.3949 9675	.3688 1524	.3208 3350
3.50	.4792 0913	.4502 2004	.4226 1925	.3963 9505	.3479 7822
3.55	.5063 3847	.4777 2701	.4503 5486	.4242 2336	.3756 3517
3.60	.5331 9089	.5050 8153	.4780 6623	.4521 5741	.4036 5636
3.65	.5596 5246	.5321 5934	.5056 2033	.4800 5706	.4318 9253
3.70	.5856 1747	.5588 4342	.5328 9018	.5077 8677	.4601 9557
3.75	.6109 8933	.5850 2522	.5597 5627	.5352 1730	.4884 2076
3.80	.6356 8135	.6106 0563	.5861 0793	.5622 2734	.5164 2884
3.85	.6596 1714	.6354 9574	.6118 4424	.5887 0474	.5440 8783
3.90	.6827 3095	.6596 1731	.6368 7486	.6145 4751	.5712 7458
3.95	.7049 6770	.6829 0309	.6611 2050	.6396 6464	.5978 7604
4.00	.7262 8291	.7052 9690	.6845 1321	.6639 7655	.6237 9024
4.05	.7466 4238	.7267 5345	.7069 9645	.6874 1535	.6489 2702
4.10	.7660 2182	.7472 3812	.7285 2490	.7099 2488	.6732 0843
4.15	.7844 0631	.7667 2646	.7490 6420	.7314 6052	.6965 6889
4.20	.8017 8968	.7852 0370	.7685 9044	.7519 8885	.7189 5517
4.25	.8181 7379	.8026 6403	.7870 8958	.7714 8713	.7403 2603
4.30	.8335 6780	.8191 0992	.8045 5677	.7899 4264	.7606 5184
4.35	.8479 8741	.8345 5129	.8209 9555	.8073 5199	.7799 1390
4.40	.8614 5402	.8490 0473	.8364 1705	.8237 2028	.7981 0376
4.45	.8739 9401	.8624 9269	.8508 3916	.8390 6025	.8152 2233
4.50	.8856 3789	.8750 4260	.8642 8563	.8533 9139	.8312 7904
4.55	.8964 1961	.8866 8612	.8767 8524	.8667 3908	.8462 9088
4.60	.9063 7584	.8974 5836	.8883 7099	.8791 3366	.8602 8144
4.65	.9155 4529	.9073 9712	.8990 7928	.8906 0962	.8732 7999
4.70	.9239 6812	.9165 4226	.9089 4917	.9012 0479	.8853 2053
4.75	.9316 8536	.9249 3500	.9180 2167	.9109 5954	.8964 4093
4.80	.9387 3845	.9326 1743	.9263 3913	.9199 1609	.9066 8208
4.85	.9451 6873	.9396 3192	.9339 4462	.9281 1790	.9160 8709
4.90	.9510 1712	.9460 2073	.9408 8145	.9356 0900	.9247 0061
4.95	.9563 2371	.9518 2557	.9471 9268	.9424 3354	.9325 6817
5.00	.9611 2758	.9570 8731	.9529 2076	.9486 3534	.9397 3558

W_0	$P(W_0,.17)$	$P(W_0,.18)$	$P(W_0,.19)$	$P(W_0,.20)$	$P(W_0,.22)$
5.05	.9654 6646	.9618 4565	.9581 0715	.9542 5743	.9462 4845
5.10	.9693 7663	.9661 3890	.9627 9209	.9593 4181	.9521 5174
5.15	.9728 9271	.9700 0384	.9670 1435	.9639 2909	.9574 8938
5.20	.9760 4762	.9734 7553	.9708 1104	.9680 5835	.9623 0398
5.25	.9788 7246	.9765 8722	.9742 1750	.9717 6690	.9666 3656
5.30	.9813 9649	.9793 7030	.9772 6719	.9750 9023	.9705 2639
5.35	.9836 4712	.9818 5426	.9799 9163	.9780 6185	.9740 1079
5.40	.9856 4991	.9840 6668	.9824 2040	.9807 1329	.9771 2509
5.45	.9874 2861	.9860 3326	.9845 8111	.9830 7407	.9799 0251
5.50	.9890 0519	.9877 7781	.9864 9943	.9851 7168	.9823 7418
5.55	.9903 9993	.9893 2236	.9881 9915	.9870 3168	.9845 6913
5.60	.9916 3146	.9906 8718	.9897 0220	.9886 7766	.9865 1429
5.65	.9927 1682	.9918 9089	.9910 2875	.9901 3137	.9882 3457
5.70	.9936 7159	.9929 5050	.9921 9729	.9914 1278	.9897 5291
5.75	.9945 0995	.9938 8154	.9932 2470	.9925 4013	.9910 9038
5.80	.9952 4477	.9946 9809	.9941 2633	.9935 3007	.9922 6622
5.85	.9958 8768	.9954 1294	.9949 1614	.9943 9774	.9932 9799
5.90	.9964 4919	.9960 3764	.9956 0672	.9951 5683	.9942 0162
5.95	.9969 3875	.9965 8259	.9962 0947	.9958 1972	.9949 9155
6.00	.9973 6484	.9970 5715	.9967 3463	.9963 9757	.9956 8082
6.05	.9977 3506	.9974 6968	.9971 9139	.9969 0039	.9962 8117
6.10	.9980 5620	.9978 2770	.9975 8796	.9973 3716	.9968 0312
6.15	.9983 3429	.9981 3787	.9979 3169	.9977 1590	.9972 5611
6.20	.9985 7472	.9984 0614	.9982 2911	.9980 4376	.9976 4857
6.25	.9987 8224	.9986 3779	.9984 8604	.9983 2709	.9979 8799
6.30	.9989 6106	.9988 3749	.9987 0762	.9985 7154	.9982 8105
6.35	.9991 1492	.9990 0937	.9988 9840	.9987 8208	.9985 3365
6.40	.9992 4707	.9991 5706	.9990 6239	.9989 6313	.9987 5100
6.45	.9993 6042	.9992 8377	.9992 0314	.9991 1856	.9989 3772
6.50	.9994 5747	.9993 9231	.9993 2374	.9992 5178	.9990 9787
6.55	.9995 4045	.9994 8514	.9994 2691	.9993 6579	.9992 3500
6.60	.9996 1129	.9995 6440	.9995 1503	.9994 6320	.9993 5223
6.65	.9996 7166	.9996 3199	.9995 9019	.9995 4630	.9994 5229
6.70	.9997 2305	.9996 8952	.9996 5419	.9996 1708	.9995 3756
6.75	.9997 6672	.9997 3842	.9997 0861	.9996 7727	.9996 1011
6.80	.9998 0377	.9997 7993	.9997 5480	.9997 2839	.9996 7175
6.85	.9998 3516	.9998 1511	.9997 9396	.9997 7172	.9997 2404
6.90	.9998 6172	.9998 4487	.9998 2710	.9998 0841	.9997 6832
6.95	.9998 8416	.9998 7003	.9998 5511	.9998 3943	.9998 0577
7.00	.9999 0309	.9998 9125	.9998 7875	.9998 6561	.9998 3739
7.05	.9999 1904	.9999 0913	.9998 9867	.9998 8767	.9998 6405
7.10	.9999 3245	.9999 2417	.9999 1544	.9999 0624	.9998 8650
7.15	.9999 4371	.9999 3681	.9999 2952	.9999 2185	.9999 0537
7.20	.9999 5316	.9999 4741	.9999 4134	.9999 3494	.9999 2121
7.25	.9999 6108	.9999 5629	.9999 5124	.9999 4592	.9999 3448
7.30	.9999 6770	.9999 6372	.9999 5952	.9999 5510	.9999 4560
7.35	.9999 7323	.9999 6993	.9999 6644	.9999 6278	.9999 5489
7.40	.9999 7784	.9999 7511	.9999 7222	.9999 6918	.9999 6264
7.45	.9999 8168	.9999 7942	.9999 7703	.9999 7451	.9999 6910
7.50	.9999 8487	.9999 8301	.9999 8103	.9999 7895	.9999 7448

W_0	$P(W_0,17)$	$P(W_0,18)$	$P(W_0,19)$	$P(W_0,20)$	$P(W_0,22)$
7.55	.9999 8753	.9999 8599	.9999 8436	.9999 8264	.9999 7895
7.60	.9999 8973	.9999 8846	.9999 8712	.9999 8570	.9999 8266
7.65	.9999 9155	.9999 9051	.9999 8940	.9999 8824	.9999 8573
7.70	.9999 9306	.9999 9220	.9999 9130	.9999 9034	.9999 8828
7.75	.9999 9431	.9999 9360	.9999 9286	.9999 9207	.9999 9038
7.80	.9999 9534	.9999 9476	.9999 9415	.9999 9351	.9999 9212
7.85	.9999 9619	.9999 9571	.9999 9521	.9999 9469	.9999 9355
7.90	.9999 9688	.9999 9650	.9999 9609	.9999 9566	.9999 9473
7.95	.9999 9746	.9999 9714	.9999 9681	.9999 9645	.9999 9570
8.00	.9999 9793	.9999 9767	.9999 9740	.9999 9711	.9999 9649
8.05	.9999 9831	.9999 9810	.9999 9788	.9999 9765	.9999 9714
8.10	.9999 9863	.9999 9846	.9999 9828	.9999 9809	.9999 9768
8.15	.9999 9889	.9999 9875	.9999 9860	.9999 9845	.9999 9811
8.20	.9999 9910	.9999 9898	.9999 9887	.9999 9874	.9999 9847
8.25	.9999 9927	.9999 9918	.9999 9908	.9999 9898	.9999 9876
8.30	.9999 9941	.9999 9933	.9999 9926	.9999 9917	.9999 9900
8.35	.9999 9952	.9999 9946	.9999 9940	.9999 9933	.9999 9919
8.40	.9999 9961	.9999 9957	.9999 9952	.9999 9946	.9999 9935
8.45	.9999 9969	.9999 9965	.9999 9961	.9999 9957	.9999 9947
8.50	.9999 9975	.9999 9972	.9999 9969	.9999 9965	.9999 9958
8.55	.9999 9980	.9999 9977	.9999 9975	.9999 9972	.9999 9966
8.60	.9999 9984	.9999 9982	.9999 9980	.9999 9977	.9999 9973
8.65	.9999 9987	.9999 9985	.9999 9984	.9999 9982	.9999 9978
8.70	.9999 9990	.9999 9988	.9999 9987	.9999 9986	.9999 9982
8.75	.9999 9992	.9999 9991	.9999 9990	.9999 9988	.9999 9986
8.80	.9999 9993	.9999 9993	.9999 9992	.9999 9991	.9999 9989
8.85	.9999 9995	.9999 9994	.9999 9993	.9999 9993	.9999 9991
8.90	.9999 9996	.9999 9995	.9999 9995	.9999 9994	.9999 9993
8.95	.9999 9997	.9999 9996	.9999 9996	.9999 9995	.9999 9994
9.00	.9999 9997	.9999 9997	.9999 9997	.9999 9996	.9999 9995
9.05	.9999 9998	.9999 9998	.9999 9997	.9999 9997	.9999 9996
9.10	.9999 9998	.9999 9998	.9999 9998	.9999 9998	.9999 9997
9.15	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9998
9.20	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
9.25	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.30	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.35	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.40	1.0000 0000	1.0000 0000	.9999 9999	.9999 9999	.9999 9999
9.45			1.0000 0000	1.0000 0000	.9999 9999
9.50					1.0000 0000
9.55					
9.60					
9.65					
9.70					
9.75					
9.80					
9.85					
9.90					
9.95					
10.00					

W_0	$P(W_0, .24)$	$P(W_0, .26)$	$P(W_0, .28)$	$P(W_0, .30)$	$P(W_0, .32)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05	.0000 0000				
1.10	.0000 0001				
1.15	.0000 0002	.0000 0000			
1.20	.0000 0005	.0000 0001	.0000 0000		
1.25	.0000 0011	.0000 0003	.0000 0001		
1.30	.0000 0025	.0000 0006	.0000 0001	.0000 0000	
1.35	.0000 0051	.0000 0013	.0000 0003	.0000 0001	.0000 0000
1.40	.0000 0104	.0000 0029	.0000 0008	.0000 0002	.0000 0001
1.45	.0000 0202	.0000 0059	.0000 0017	.0000 0005	.0000 0001
1.50	.0000 0382	.0000 0119	.0000 0037	.0000 0011	.0000 0004
1.55	.0000 0702	.0000 0230	.0000 0075	.0000 0025	.0000 0008
1.60	.0000 1253	.0000 0433	.0000 0149	.0000 0051	.0000 0018
1.65	.0000 2178	.0000 0790	.0000 0286	.0000 0103	.0000 0037
1.70	.0000 3692	.0000 1404	.0000 0532	.0000 0201	.0000 0076
1.75	.0000 6113	.0000 2431	.0000 0964	.0000 0381	.0000 0151
1.80	.0000 9895	.0000 4107	.0000 1700	.0000 0702	.0000 0289
1.85	.0001 5676	.0000 6781	.0000 2925	.0000 1258	.0000 0540
1.90	.0002 4335	.0001 0949	.0000 4912	.0000 2199	.0000 0982
1.95	.0003 7049	.0001 7309	.0000 8065	.0000 3748	.0000 1739
2.00	.0005 5368	.0002 6820	.0001 2955	.0000 6243	.0000 3002
2.05	.0008 1292	.0004 0763	.0002 0384	.0001 0169	.0000 5062
2.10	.0011 7348	.0006 0826	.0003 1442	.0001 6215	.0000 8344
2.15	.0016 6670	.0008 9179	.0004 7586	.0002 5333	.0001 3458
2.20	.0023 3075	.0012 8562	.0007 0722	.0003 8813	.0002 1258
2.25	.0032 1123	.0018 2368	.0010 3290	.0005 8366	.0003 2913
2.30	.0043 6166	.0025 4717	.0014 8356	.0008 6207	.0004 9992
2.35	.0058 4367	.0035 0518	.0020 9693	.0012 5158	.0007 4551
2.40	.0077 2704	.0047 5519	.0029 1863	.0017 8730	.0010 9230
2.45	.0100 8931	.0063 6320	.0040 0272	.0025 1217	.0015 7354
2.50	.0130 1505	.0084 0366	.0054 1209	.0034 7763	.0022 3019

W_0	$P(W_0, .24)$	$P(W_0, .26)$	$P(W_0, .28)$	$P(W_0, .30)$	$P(W_0, .32)$
2.55	.0165 9480	.0109 5894	.0072 1853	.0047 4414	.0031 1181
2.60	.0209 2362	.0141 1852	.0095 0245	.0063 8143	.0042 7715
2.65	.0260 9925	.0179 7772	.0123 5223	.0084 6840	.0057 9452
2.70	.0322 1997	.0226 3599	.0158 6312	.0110 9255	.0077 4180
2.75	.0393 8228	.0281 9490	.0201 3568	.0143 4911	.0102 0607
2.80	.0476 7830	.0347 5580	.0252 7387	.0183 3955	.0132 8277
2.85	.0571 9314	.0424 1723	.0313 8273	.0231 6977	.0170 7435
2.90	.0680 0229	.0512 7212	.0385 6575	.0289 4779	.0216 8847
2.95	.0801 6911	.0614 0503	.0469 2205	.0357 8112	.0272 3579
3.00	.0937 4257	.0728 8942	.0565 4341	.0437 7386	.0338 2721
3.05	.1087 5524	.0857 8501	.0675 1136	.0530 2362	.0415 7098
3.10	.1252 2176	.1001 3554	.0798 9432	.0636 1842	.0505 6948
3.15	.1431 3766	.1159 6685	.0937 4507	.0756 3366	.0609 1595
3.20	.1624 7880	.1332 8535	.1090 9851	.0891 2930	.0726 9132
3.25	.1832 0122	.1520 7713	.1259 6987	.1041 4742	.0859 6115
3.30	.2052 4157	.1723 0749	.1443 5352	.1207 1017	.1007 7299
3.35	.2285 1805	.1939 2116	.1642 2224	.1388 1830	.1171 5414
3.40	.2529 3181	.2168 4296	.1855 2718	.1584 5026	.1351 0995
3.45	.2783 6868	.2409 7906	.2081 9840	.1795 6197	.1546 2279
3.50	.3047 0140	.2662 1868	.2321 4594	.2020 8715	.1756 5163
3.55	.3317 9194	.2924 3618	.2572 6147	.2259 3842	.1981 3233
3.60	.3594 9414	.3194 9354	.2834 2038	.2510 0876	.2219 7861
3.65	.3876 5635	.3472 4293	.3104 8422	.2771 7371	.2470 8358
3.70	.4161 2411	.3755 2962	.3383 0347	.3042 9378	.2733 2184
3.75	.4447 4282	.4041 9475	.3667 2042	.3322 1731	.3005 5211
3.80	.4733 6021	.4330 7820	.3955 7220	.3607 8355	.3286 2008
3.85	.5018 2864	.4620 2128	.4246 9378	.3898 2571	.3573 6158
3.90	.5300 0720	.4908 6926	.4539 2085	.4191 7421	.3866 0592
3.95	.5577 6346	.5194 7365	.4830 9257	.4486 5971	.4161 7912
4.00	.5849 7503	.5476 9425	.5120 5401	.4781 1597	.4459 0721
4.05	.6115 3070	.5754 0080	.5406 5839	.5073 8256	.4756 1921
4.10	.6373 3137	.6024 7438	.5687 6892	.5363 0718	.5051 4996
4.15	.6622 9059	.6288 0847	.5962 6033	.5647 4768	.5343 4257
4.20	.6863 3486	.6543 0958	.6230 2005	.5925 7366	.5630 5057
4.25	.7094 0369	.6788 9776	.6489 4900	.6196 6782	.5911 3962
4.30	.7314 4933	.7025 0662	.6739 6210	.6459 2678	.6184 8887
4.35	.7524 3641	.7250 8319	.6979 8841	.6712 6164	.6449 9189
4.40	.7723 4129	.7465 8755	.7209 7100	.6955 9820	.6705 5721
4.45	.7911 5138	.7669 9223	.7428 6661	.7188 7680	.6951 0859
4.50	.8088 6423	.7862 8148	.7636 4504	.7410 5200	.7185 8483
4.55	.8254 8661	.8044 5033	.7832 8836	.7620 9194	.7409 3942
4.60	.8410 3359	.8215 0373	.8017 9005	.7819 7755	.7621 3991
4.65	.8555 2744	.8374 5541	.8191 5394	.8007 0159	.7821 6702
4.70	.8689 9670	.8523 2691	.8353 9320	.8182 6765	.8010 1373
4.75	.8814 7514	.8661 4645	.8505 2916	.8346 8896	.8186 8408
4.80	.8930 0086	.8789 4794	.8645 9024	.8499 8727	.8351 9208
4.85	.9036 1533	.8907 6993	.8776 1084	.8641 9166	.8505 6045
4.90	.9133 6258	.9016 5464	.8896 3024	.8773 3741	.8648 1941
4.95	.9222 8843	.9116 4710	.9006 9164	.8894 6486	.8780 0549
5.00	.9304 3975	.9207 9431	.9108 4118	.9006 1836	.8901 6036

W_0	$P(W_0+.24)$	$P(W_0+.26)$	$P(W_0+.28)$	$P(W_0+.30)$	$P(W_0+.32)$
5.05	.9378 6388	.9291 4445	.9201 2707	.9108 4529	.9013 2972
5.10	.9446 0803	.9367 4627	.9285 9881	.9201 9516	.9115 6234
5.15	.9507 1884	.9436 4845	.9363 0647	.9287 1876	.9209 0906
5.20	.9562 4194	.9498 9912	.9433 0010	.9364 6745	.9294 2196
5.25	.9612 2164	.9555 4540	.9496 2915	.9434 9252	.9371 5364
5.30	.9657 0065	.9606 3306	.9553 4205	.9498 4463	.9441 5654
5.35	.9697 1984	.9652 0622	.9604 8582	.9555 7332	.9504 8236
5.40	.9733 1811	.9693 0712	.9651 0577	.9607 2668	.9561 8164
5.45	.9765 3227	.9729 7595	.9692 4523	.9653 5098	.9613 0330
5.50	.9793 9694	.9762 5070	.9729 4544	.9694 9044	.9658 9439
5.55	.9819 4458	.9791 6715	.9762 4535	.9731 8710	.9699 9980
5.60	.9842 0542	.9817 5878	.9791 8160	.9764 8062	.9736 6214
5.65	.9862 0752	.9840 5678	.9817 8846	.9794 0826	.9769 2156
5.70	.9879 7685	.9860 9009	.9840 9781	.9820 0484	.9798 1573
5.75	.9895 3727	.9878 8544	.9861 3923	.9843 0273	.9823 7979
5.80	.9909 1070	.9894 6741	.9879 4000	.9863 3191	.9846 4638
5.85	.9921 1717	.9908 5856	.9895 2521	.9881 2000	.9866 4566
5.90	.9931 7492	.9920 7946	.9909 1780	.9896 9236	.9884 0541
5.95	.9941 0051	.9931 4886	.9921 3875	.9910 7218	.9899 5108
6.00	.9949 0892	.9940 8375	.9932 0709	.9922 8061	.9913 0593
6.05	.9956 1368	.9948 9949	.9941 4008	.9933 3684	.9924 9111
6.10	.9962 2694	.9956 0993	.9949 5331	.9942 5824	.9935 2581
6.15	.9967 5963	.9962 2753	.9956 6082	.9950 6046	.9944 2737
6.20	.9972 2150	.9967 6344	.9962 7521	.9957 5761	.9952 1141
6.25	.9976 2126	.9972 2762	.9968 0775	.9963 6232	.9958 9194
6.30	.9979 6666	.9976 2897	.9972 6852	.9968 8587	.9964 8153
6.35	.9982 6458	.9979 7537	.9976 6648	.9973 3834	.9969 9139
6.40	.9985 2111	.9982 7384	.9980 0958	.9977 2868	.9974 3150
6.45	.9987 4162	.9985 3056	.9983 0486	.9980 6482	.9978 1071
6.50	.9989 3086	.9987 5101	.9985 5857	.9983 5378	.9981 3688
6.55	.9990 9299	.9989 3998	.9987 7617	.9986 0176	.9984 1693
6.60	.9992 3167	.9991 0171	.9989 6250	.9988 1420	.9986 5696
6.65	.9993 5011	.9992 3989	.9991 2177	.9989 9589	.9988 6235
6.70	.9994 5109	.9993 5777	.9992 5771	.9991 5102	.9990 3780
6.75	.9995 3705	.9994 5816	.9993 7353	.9992 8326	.9991 8742
6.80	.9996 1011	.9995 4352	.9994 7206	.9993 9580	.9993 1480
6.85	.9996 7210	.9996 1599	.9995 5574	.9994 9141	.9994 2307
6.90	.9997 2464	.9996 7741	.9996 2669	.9995 7252	.9995 1494
6.95	.9997 6908	.9997 2940	.9996 8677	.9996 4122	.9995 9279
7.00	.9998 0662	.9997 7333	.9997 3755	.9996 9931	.9996 5864
7.05	.9998 3828	.9998 1040	.9997 8042	.9997 4836	.9997 1425
7.10	.9998 6495	.9998 4162	.9998 1654	.9997 8970	.9997 6115
7.15	.9998 8738	.9998 6789	.9998 4693	.9998 2451	.9998 0063
7.20	.9999 0621	.9998 8996	.9998 7247	.9998 5375	.9998 3382
7.25	.9999 2199	.9999 0846	.9998 9389	.9998 7830	.9998 6168
7.30	.9999 3521	.9999 2396	.9999 1184	.9998 9886	.9998 8504
7.35	.9999 4626	.9999 3692	.9999 2685	.9999 1607	.9999 0458
7.40	.9999 5549	.9999 4774	.9999 3939	.9999 3044	.9999 2091
7.45	.9999 6318	.9999 5676	.9999 4985	.9999 4243	.9999 3453
7.50	.9999 6959	.9999 6428	.9999 5856	.9999 5242	.9999 4588

W_0	$P(W_0,.24)$	$P(W_0,.26)$	$P(W_0,.28)$	$P(W_0,.30)$	$P(W_0,.32)$
7.55	.9999 7491	.9999 7052	.9999 6580	.9999 6073	.9999 5533
7.60	.9999 7933	.9999 7571	.9999 7181	.9999 6763	.9999 6318
7.65	.9999 8299	.9999 8001	.9999 7680	.9999 7336	.9999 6968
7.70	.9999 8602	.9999 8357	.9999 8093	.9999 7810	.9999 7508
7.75	.9999 8853	.9999 8652	.9999 8435	.9999 8202	.9999 7954
7.80	.9999 9060	.9999 8895	.9999 8717	.9999 8526	.9999 8322
7.85	.9999 9231	.9999 9095	.9999 8950	.9999 8793	.9999 8626
7.90	.9999 9371	.9999 9260	.9999 9141	.9999 9013	.9999 8876
7.95	.9999 9486	.9999 9396	.9999 9299	.9999 9194	.9999 9082
8.00	.9999 9581	.9999 9508	.9999 9428	.9999 9343	.9999 9252
8.05	.9999 9659	.9999 9599	.9999 9534	.9999 9465	.9999 9390
8.10	.9999 9723	.9999 9674	.9999 9621	.9999 9565	.9999 9504
8.15	.9999 9775	.9999 9735	.9999 9692	.9999 9646	.9999 9597
8.20	.9999 9817	.9999 9785	.9999 9750	.9999 9713	.9999 9673
8.25	.9999 9852	.9999 9826	.9999 9798	.9999 9767	.9999 9735
8.30	.9999 9880	.9999 9859	.9999 9836	.9999 9812	.9999 9786
8.35	.9999 9903	.9999 9886	.9999 9868	.9999 9848	.9999 9827
8.40	.9999 9922	.9999 9908	.9999 9893	.9999 9877	.9999 9860
8.45	.9999 9937	.9999 9926	.9999 9914	.9999 9901	.9999 9887
8.50	.9999 9949	.9999 9940	.9999 9931	.9999 9920	.9999 9909
8.55	.9999 9959	.9999 9952	.9999 9944	.9999 9936	.9999 9927
8.60	.9999 9967	.9999 9961	.9999 9955	.9999 9949	.9999 9941
8.65	.9999 9974	.9999 9969	.9999 9964	.9999 9959	.9999 9953
8.70	.9999 9979	.9999 9975	.9999 9971	.9999 9967	.9999 9962
8.75	.9999 9983	.9999 9980	.9999 9977	.9999 9974	.9999 9970
8.80	.9999 9987	.9999 9984	.9999 9982	.9999 9979	.9999 9976
8.85	.9999 9989	.9999 9987	.9999 9985	.9999 9983	.9999 9981
8.90	.9999 9991	.9999 9990	.9999 9988	.9999 9987	.9999 9985
8.95	.9999 9993	.9999 9992	.9999 9991	.9999 9989	.9999 9988
9.00	.9999 9995	.9999 9994	.9999 9993	.9999 9991	.9999 9990
9.05	.9999 9996	.9999 9995	.9999 9994	.9999 9993	.9999 9992
9.10	.9999 9997	.9999 9996	.9999 9995	.9999 9995	.9999 9994
9.15	.9999 9997	.9999 9997	.9999 9996	.9999 9996	.9999 9995
9.20	.9999 9998	.9999 9997	.9999 9997	.9999 9997	.9999 9996
9.25	.9999 9998	.9999 9998	.9999 9998	.9999 9997	.9999 9997
9.30	.9999 9999	.9999 9998	.9999 9998	.9999 9998	.9999 9998
9.35	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9998
9.40	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.45	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.50	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.55	1.0000 0000	1.0000 0000	.9999 9999	.9999 9999	.9999 9999
9.60			1.0000 0000	1.0000 0000	.9999 9999
9.65					1.0000 0000
9.70					
9.75					
9.80					
9.85					
9.90					
9.95					
10.00					

W_0	$P(W_0,.34)$	$P(W_0,.36)$	$P(W_0,.38)$	$P(W_0,.40)$	$P(W_0,.50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20					
1.25					
1.30					
1.35					
1.40					
1.45	.0000 0000				
1.50	.0000 0001	.0000 0000			
1.55	.0000 0003	.0000 0001	.0000 0000		
1.60	.0000 0006	.0000 0002	.0000 0001	.0000 0000	
1.65	.0000 0013	.0000 0005	.0000 0002	.0000 0001	
1.70	.0000 0029	.0000 0011	.0000 0004	.0000 0002	
1.75	.0000 0059	.0000 0023	.0000 0009	.0000 0004	
1.80	.0000 0119	.0000 0049	.0000 0020	.0000 0008	
1.85	.0000 0232	.0000 0099	.0000 0042	.0000 0018	.0000 0000
1.90	.0000 0438	.0000 0195	.0000 0087	.0000 0038	.0000 0001
1.95	.0000 0805	.0000 0372	.0000 0172	.0000 0079	.0000 0002
2.00	.0000 1441	.0000 0691	.0000 0330	.0000 0158	.0000 0004
2.05	.0000 2516	.0000 1248	.0000 0618	.0000 0306	.0000 0009
2.10	.0000 4286	.0000 2198	.0000 1126	.0000 0576	.0000 0020
2.15	.0000 7137	.0000 3778	.0000 1997	.0000 1055	.0000 0043
2.20	.0001 1621	.0000 6343	.0000 3457	.0000 1882	.0000 0089
2.25	.0001 8527	.0001 0412	.0000 5843	.0000 3275	.0000 0178
2.30	.0002 8939	.0001 6725	.0000 9652	.0000 5563	.0000 0348
2.35	.0004 4328	.0002 6315	.0001 5600	.0000 9236	.0000 0661
2.40	.0006 6638	.0004 0589	.0002 4688	.0001 4997	.0000 1221
2.45	.0009 8387	.0006 1421	.0003 8290	.0002 3840	.0000 2196
2.50	.0014 2770	.0009 1255	.0005 8246	.0003 7131	.0000 3849

W_0	$P(W_0, .34)$	$P(W_0, .36)$	$P(W_0, .38)$	$P(W_0, .40)$	$P(W_0, .50)$
2.55	.0020 3757	.0013 3211	.0008 6968	.0005 6707	.0000 6583
2.60	.0028 6181	.0019 1187	.0012 7548	.0008 4986	.0001 0994
2.65	.0039 5812	.0026 9958	.0018 3869	.0012 5078	.0001 7948
2.70	.0053 9404	.0037 5256	.0026 0705	.0018 0899	.0002 8667
2.75	.0072 4704	.0051 3818	.0036 3807	.0025 7278	.0004 4834
2.80	.0096 0425	.0069 3411	.0049 9960	.0036 0043	.0006 8713
2.85	.0125 6170	.0092 2807	.0067 7011	.0049 6088	.0010 3280
2.90	.0162 2302	.0121 1711	.0090 3845	.0067 3397	.0015 2353
2.95	.0206 9773	.0157 0638	.0119 0319	.0090 1026	.0022 0726
3.00	.0260 9890	.0201 0739	.0154 7136	.0118 9032	.0031 4281
3.05	.0325 4050	.0254 3563	.0198 5666	.0154 8343	.0044 0079
3.10	.0401 3430	.0318 0788	.0251 7708	.0199 0576	.0060 6408
3.15	.0489 8664	.0393 3903	.0315 5207	.0252 7788	.0082 2785
3.20	.0591 9494	.0481 3867	.0390 9926	.0317 2178	.0109 9894
3.25	.0708 4442	.0583 0755	.0479 3096	.0393 5756	.0144 9458
3.30	.0840 0483	.0699 3406	.0581 5042	.0482 9966	.0188 4040
3.35	.0987 2767	.0830 9090	.0698 4822	.0586 5313	.0241 6771
3.40	.1150 4372	.0978 3205	.0830 9880	.0705 0977	.0306 1018
3.45	.1329 6126	.1141 9026	.0979 5729	.0839 4457	.0382 9993
3.50	.1524 6486	.1321 7511	.1144 5691	.0990 1251	.0473 6328
3.55	.1735 1490	.1517 7173	.1326 0697	.1157 4585	.0579 1632
3.60	.1960 4778	.1729 4027	.1523 9158	.1341 5211	.0700 6041
3.65	.2199 7689	.1956 1613	.1737 6908	.1542 1281	.0838 7804
3.70	.2451 9414	.2197 1091	.1966 7235	.1758 8297	.0994 2905
3.75	.2715 7218	.2451 1408	.2210 0983	.1990 9147	.1167 4752
3.80	.2989 6701	.2716 9518	.2466 6722	.2237 4221	.1358 3946
3.85	.3272 2102	.2993 0664	.2735 0996	.2497 1600	.1566 8141
3.90	.3561 6633	.3277 8693	.3013 8601	.2768 7309	.1792 2003
3.95	.3856 2811	.3569 6396	.3301 2929	.3050 5625	.2033 7267
4.00	.4154 2816	.3866 5869	.3595 6315	.3340 9425	.2290 2890
4.05	.4453 8816	.4166 8869	.3895 0416	.3638 0557	.2560 5286
4.10	.4753 3291	.4468 7164	.4197 6578	.3940 0231	.2842 8646
4.15	.5050 9325	.4770 2863	.4501 6198	.4244 9397	.3135 5307
4.20	.5345 0856	.5069 8712	.4805 1064	.4550 9119	.3436 6170
4.25	.5634 2907	.5365 8366	.5106 3658	.4856 0916	.3744 1138
4.30	.5917 1756	.5656 6608	.5403 7428	.5158 7077	.4055 9569
4.35	.6192 5078	.5940 9534	.5695 7015	.5457 0930	.4370 0711
4.40	.6459 2044	.6217 4693	.5980 8437	.5749 7070	.4684 4124
4.45	.6716 3369	.6485 1179	.6257 9221	.6035 1534	.4997 0054
4.50	.6963 1341	.6742 9687	.6525 8497	.6312 1937	.5305 9779
4.55	.7198 9801	.6990 2529	.6783 7049	.6579 7552	.5609 5886
4.60	.7423 4099	.7226 3612	.7030 7320	.6836 9356	.5906 2502
4.65	.7636 1029	.7450 8391	.7266 3385	.7083 0023	.6194 5473
4.70	.7836 8737	.7663 3795	.7490 0902	.7317 3899	.6473 2469
4.75	.8025 6621	.7863 8129	.7701 7019	.7539 6926	.6741 3057
4.80	.8202 5208	.8052 0967	.7901 0283	.7749 6559	.6997 8710
4.85	.8367 6037	.8228 3026	.8088 0513	.7947 1655	.7242 2776
4.90	.8521 1530	.8392 6042	.8262 8678	.8132 2342	.7474 0413
4.95	.8663 4868	.8545 2635	.8425 6760	.8304 9894	.7692 8490
5.00	.8794 9860	.8686 6181	.8576 7621	.8465 6585	.7898 5462

W_0	$P(W_0,.34)$	$P(W_0,.36)$	$P(W_0,.38)$	$P(W_0,.40)$	$P(W_0,.50)$
5.05	.8916 0834	.8817 0679	.8716 4862	.8614 5550	.8091 1231
5.10	.9027 2514	.8937 0635	.8845 2699	.8752 0646	.8270 6991
5.15	.9128 9922	.9047 0943	.8963 5833	.8878 6321	.8437 5070
5.20	.9221 8282	.9147 6779	.9071 9336	.8994 7484	.8591 8769
5.25	.9306 2929	.9239 3505	.9170 8542	.9100 9390	.8734 2200
5.30	.9382 9240	.9322 6583	.9260 8951	.9197 7531	.8865 0137
5.35	.9452 2563	.9398 1496	.9342 6143	.9285 7539	.8984 7871
5.40	.9514 8161	.9466 3685	.9416 5699	.9365 5103	.9094 1071
5.45	.9571 1166	.9527 8491	.9483 3139	.9437 5891	.9193 5669
5.50	.9621 6539	.9583 1109	.9543 3866	.9502 5487	.9283 7744
5.55	.9666 9043	.9632 6551	.9597 3122	.9560 9340	.9365 3433
5.60	.9707 3211	.9676 9614	.9645 5950	.9613 2719	.9438 8839
5.65	.9743 3342	.9716 4861	.9688 7164	.9660 0679	.9504 9967
5.70	.9775 3477	.9751 6603	.9727 1334	.9701 8035	.9564 2664
5.75	.9803 7404	.9782 8891	.9761 2767	.9738 9342	.9617 2569
5.80	.9828 8647	.9810 5510	.9791 5503	.9771 8888	.9664 5080
5.85	.9851 0478	.9834 9980	.9818 3306	.9801 0678	.9706 5325
5.90	.9870 5913	.9856 5558	.9841 9673	.9826 8443	.9743 8143
5.95	.9887 7726	.9875 5245	.9862 7829	.9849 5636	.9776 8069
6.00	.9902 8455	.9892 1792	.9881 0743	.9869 5438	.9805 9335
6.05	.9916 0415	.9906 7717	.9897 1131	.9887 0769	.9831 5864
6.10	.9927 5710	.9919 5309	.9911 1474	.9902 4299	.9854 1278
6.15	.9937 6242	.9930 6644	.9923 4023	.9915 8456	.9873 8903
6.20	.9946 3731	.9940 3601	.9934 0817	.9927 5443	.9891 1781
6.25	.9953 9721	.9948 7870	.9943 3696	.9937 7252	.9906 2682
6.30	.9960 5598	.9956 0970	.9951 4315	.9946 5674	.9919 4118
6.35	.9966 2602	.9962 4262	.9958 4156	.9954 2320	.9930 8362
6.40	.9971 1835	.9967 8957	.9964 4546	.9960 8630	.9940 7457
6.45	.9975 4281	.9972 6137	.9969 6665	.9966 5889	.9949 3239
6.50	.9979 0808	.9976 6760	.9974 1564	.9971 5240	.9956 7348
6.55	.9982 2186	.9980 1673	.9978 0171	.9975 7696	.9963 1248
6.60	.9984 9094	.9983 1627	.9981 3310	.9979 4154	.9968 6239
6.65	.9987 2129	.9985 7281	.9984 1703	.9982 5405	.9973 3474
6.70	.9989 1814	.9987 9214	.9986 5988	.9985 2146	.9977 3970
6.75	.9990 8608	.9989 7933	.9988 6724	.9987 4987	.9980 8626
6.80	.9992 2912	.9991 3883	.9990 4398	.9989 4464	.9983 8229
6.85	.9993 5075	.9992 7450	.9991 9438	.9991 1043	.9986 3471
6.90	.9994 5400	.9993 8972	.9993 2214	.9992 5132	.9988 4957
6.95	.9995 4150	.9994 8740	.9994 3050	.9993 7084	.9990 3213
7.00	.9996 1555	.9995 7008	.9995 2225	.9994 7208	.9991 8698
7.05	.9996 7811	.9996 3995	.9995 9981	.9995 5769	.9993 1811
7.10	.9997 3088	.9996 9891	.9996 6527	.9996 2996	.9994 2896
7.15	.9997 7532	.9997 4858	.9997 2043	.9996 9088	.9995 2252
7.20	.9998 1269	.9997 9035	.9997 6684	.9997 4214	.9996 0134
7.25	.9998 4406	.9998 2544	.9998 0582	.9997 8521	.9996 6765
7.30	.9998 7036	.9998 5486	.9998 3851	.9998 2135	.9997 2333
7.35	.9998 9238	.9998 7949	.9998 6590	.9998 5162	.9997 7003
7.40	.9999 1078	.9999 0008	.9998 8879	.9998 7693	.9998 0912
7.45	.9999 2614	.9999 1726	.9999 0791	.9998 9807	.9998 4179
7.50	.9999 3894	.9999 3159	.9999 2384	.9999 1570	.9998 6906

W_0	$P(W_0, .34)$	$P(W_0, .36)$	$P(W_0, .38)$	$P(W_0, .40)$	$P(W_0, .50)$
7.55	.9999 4959	.9999 4351	.9999 3711	.9999 3037	.9998 9179
7.60	.9999 5844	.9999 5342	.9999 4813	.9999 4257	.9999 1069
7.65	.9999 6578	.9999 6165	.9999 5729	.9999 5270	.9999 2640
7.70	.9999 7186	.9999 6846	.9999 6487	.9999 6109	.9999 3943
7.75	.9999 7690	.9999 7410	.9999 7115	.9999 6804	.9999 5022
7.80	.9999 8105	.9999 7876	.9999 7634	.9999 7379	.9999 5915
7.85	.9999 8448	.9999 8260	.9999 8062	.9999 7853	.9999 6652
7.90	.9999 8731	.9999 8577	.9999 8414	.9999 8243	.9999 7260
7.95	.9999 8964	.9999 8838	.9999 8705	.9999 8565	.9999 7760
8.00	.9999 9155	.9999 9052	.9999 8943	.9999 8829	.9999 8172
8.05	.9999 9311	.9999 9227	.9999 9139	.9999 9046	.9999 8510
8.10	.9999 9440	.9999 9371	.9999 9299	.9999 9223	.9999 8787
8.15	.9999 9545	.9999 9489	.9999 9431	.9999 9369	.9999 9014
8.20	.9999 9631	.9999 9586	.9999 9538	.9999 9488	.9999 9199
8.25	.9999 9701	.9999 9664	.9999 9625	.9999 9585	.9999 9351
8.30	.9999 9758	.9999 9728	.9999 9697	.9999 9664	.9999 9474
8.35	.9999 9804	.9999 9780	.9999 9755	.9999 9728	.9999 9575
8.40	.9999 9842	.9999 9823	.9999 9802	.9999 9781	.9999 9657
8.45	.9999 9873	.9999 9857	.9999 9840	.9999 9823	.9999 9723
8.50	.9999 9897	.9999 9885	.9999 9872	.9999 9858	.9999 9777
8.55	.9999 9917	.9999 9907	.9999 9897	.9999 9885	.9999 9821
8.60	.9999 9934	.9999 9926	.9999 9917	.9999 9908	.9999 9856
8.65	.9999 9947	.9999 9940	.9999 9933	.9999 9926	.9999 9884
8.70	.9999 9957	.9999 9952	.9999 9947	.9999 9941	.9999 9907
8.75	.9999 9966	.9999 9962	.9999 9957	.9999 9953	.9999 9926
8.80	.9999 9973	.9999 9969	.9999 9966	.9999 9962	.9999 9941
8.85	.9999 9978	.9999 9976	.9999 9973	.9999 9970	.9999 9953
8.90	.9999 9983	.9999 9981	.9999 9978	.9999 9976	.9999 9962
8.95	.9999 9986	.9999 9985	.9999 9983	.9999 9981	.9999 9970
9.00	.9999 9989	.9999 9988	.9999 9986	.9999 9985	.9999 9976
9.05	.9999 9991	.9999 9990	.9999 9989	.9999 9988	.9999 9981
9.10	.9999 9993	.9999 9992	.9999 9991	.9999 9990	.9999 9985
9.15	.9999 9995	.9999 9994	.9999 9993	.9999 9992	.9999 9988
9.20	.9999 9996	.9999 9995	.9999 9995	.9999 9994	.9999 9991
9.25	.9999 9997	.9999 9996	.9999 9996	.9999 9995	.9999 9993
9.30	.9999 9997	.9999 9997	.9999 9997	.9999 9996	.9999 9994
9.35	.9999 9998	.9999 9998	.9999 9997	.9999 9997	.9999 9995
9.40	.9999 9998	.9999 9998	.9999 9998	.9999 9998	.9999 9996
9.45	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9997
9.50	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
9.55	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
9.60	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.65	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.70		1.0000 0000	1.0000 0000	.9999 9999	.9999 9999
9.75				1.0000 0000	.9999 9999
9.80					.9999 9999
9.85					1.0000 0000
9.90					
9.95					
10.00					

W_0	$P(W_0,60)$	$P(W_0,70)$	$P(W_0,80)$	$P(W_0,90)$	$P(W_0,100)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20					
1.25					
1.30					
1.35					
1.40					
1.45					
1.50					
1.55					
1.60					
1.65					
1.70					
1.75					
1.80					
1.85					
1.90					
1.95					
2.00					
2.05	.0000 0000				
2.10	.0000 0001				
2.15	.0000 0002				
2.20	.0000 0004	.0000 0000			
2.25	.0000 0010	.0000 0001			
2.30	.0000 0021	.0000 0001			
2.35	.0000 0046	.0000 0003	.0000 0000		
2.40	.0000 0098	.0000 0008	.0000 0001		
2.45	.0000 0199	.0000 0018	.0000 0002		
2.50	.0000 0392	.0000 0039	.0000 0004	.0000 0000	

W_0	$P(W_0, .60)$	$P(W_0, .70)$	$P(W_0, .80)$	$P(W_0, .90)$	$P(W_0, .100)$
2.55	.0000 0750	.0000 0084	.0000 0009	.0000 0001	
2.60	.0000 1396	.0000 0175	.0000 0022	.0000 0003	.0000 0000
2.65	.0000 2528	.0000 0351	.0000 0048	.0000 0007	.0000 0001
2.70	.0000 4459	.0000 0685	.0000 0104	.0000 0016	.0000 0002
2.75	.0000 7670	.0000 1295	.0000 0217	.0000 0036	.0000 0006
2.80	.0001 2875	.0000 2382	.0000 0436	.0000 0079	.0000 0014
2.85	.0002 1113	.0000 4261	.0000 0852	.0000 0169	.0000 0033
2.90	.0003 3850	.0000 7426	.0000 1614	.0000 0348	.0000 0075
2.95	.0005 3108	.0001 2617	.0000 2969	.0000 0694	.0000 0161
3.00	.0008 1600	.0002 0922	.0000 5314	.0000 1340	.0000 0336
3.05	.0012 2887	.0003 3888	.0000 9259	.0000 2511	.0000 0677
3.10	.0018 1522	.0005 3666	.0001 5720	.0000 4572	.0000 1322
3.15	.0026 3196	.0008 3161	.0002 6036	.0000 8093	.0000 2502
3.20	.0037 4856	.0012 6203	.0004 2103	.0001 3947	.0000 4594
3.25	.0052 4783	.0018 7712	.0006 6539	.0002 3421	.0000 8198
3.30	.0072 2625	.0027 3857	.0010 2857	.0003 8363	.0001 4229
3.35	.0097 9356	.0039 2178	.0015 5653	.0006 1352	.0002 4049
3.40	.0130 7166	.0055 1679	.0023 0786	.0009 5884	.0003 9619
3.45	.0171 9265	.0076 2842	.0033 5528	.0014 6577	.0006 3684
3.50	.0222 9608	.0103 7577	.0047 8689	.0021 9359	.0009 9978
3.55	.0285 2536	.0138 9080	.0067 0664	.0032 1646	.0015 3434
3.60	.0360 2352	.0183 1596	.0092 3413	.0046 2475	.0023 0393
3.65	.0449 2856	.0238 0089	.0125 0349	.0065 2566	.0033 8790
3.70	.0553 6834	.0304 9830	.0166 6108	.0090 4313	.0048 8281
3.75	.0674 5559	.0385 5909	.0218 6237	.0123 1655	.0069 0305
3.80	.0812 8308	.0481 2696	.0282 6758	.0164 9855	.0095 8051
3.85	.0969 1924	.0593 3286	.0360 3670	.0217 5147	.0130 6306
3.90	.1144 0457	.0722 8939	.0453 2368	.0282 4284	.0175 1186
3.95	.1337 4886	.0870 8568	.0562 7041	.0361 3984	.0230 9739
4.00	.1549 2959	.1037 8283	.0690 0059	.0456 0318	.0299 9431
4.05	.1778 9132	.1224 1029	.0836 1400	.0567 8049	.0383 7542
4.10	.2025 4635	.1429 6334	.1001 8138	.0697 9980	.0484 0486
4.15	.2287 7639	.1654 0183	.1187 4026	.0847 6334	.0602 3114
4.20	.2564 3529	.1896 5019	.1392 9199	.1017 4212	.0739 8014
4.25	.2853 5261	.2155 9873	.1618 0015	.1207 7156	.0897 4874
4.30	.3153 3789	.2431 0611	.1861 9038	.1418 4847	.1075 9936
4.35	.3461 8533	.2720 0293	.2123 5160	.1649 2951	.1275 5573
4.40	.3776 7877	.3020 9606	.2401 3862	.1899 3124	.1496 0018
4.45	.4095 9679	.3331 7369	.2693 7590	.2167 3169	.1736 7266
4.50	.4417 1755	.3650 1077	.2998 6224	.2451 7342	.1996 7133
4.55	.4738 2346	.3973 7450	.3313 7627	.2750 6774	.2274 5494
4.60	.5057 0532	.4300 2985	.3636 8222	.3061 9999	.2568 4654
4.65	.5371 6600	.4627 4478	.3965 3606	.3383 3549	.2876 3855
4.70	.5680 2344	.4952 9497	.4296 9135	.3712 2592	.3195 9867
4.75	.5981 1306	.5274 6803	.4629 0497	.4046 1579	.3524 7650
4.80	.6272 8946	.5590 6697	.4959 4216	.4382 4875	.3860 1037
4.85	.6554 2755	.5899 1308	.5285 8111	.4718 7352	.4199 3421
4.90	.6824 2305	.6198 4791	.5606 1667	.5052 4918	.4539 8411
4.95	.7081 9239	.6487 3467	.5918 6329	.5381 4980	.4879 0426
5.00	.7326 7226	.6764 5887	.6221 5724	.5703 6812	.5214 5229

W_0	$P(W_0,60)$	$P(W_0,70)$	$P(W_0,80)$	$P(W_0,90)$	$P(W_0,100)$
5.05	.7558 1867	.7029 2838	.6513 5791	.6017 1849	.5544 0365
5.10	.7776 0570	.7280 7293	.6793 4845	.6320 3884	.5865 5511
5.15	.7980 2405	.7518 4318	.7060 3575	.6611 9182	.6177 2732
5.20	.8170 7937	.7742 0937	.7313 4979	.6890 6522	.6477 6641
5.25	.8347 9053	.7951 5976	.7552 4257	.7155 7166	.6765 4476
5.30	.8511 8780	.8146 9881	.7776 8659	.7406 4766	.7039 6097
5.35	.8663 1110	.8328 4531	.7986 7309	.7642 5235	.7299 3916
5.40	.8802 0822	.8496 3039	.8182 1008	.7863 6565	.7544 2770
5.45	.8929 3322	.8650 9555	.8363 2027	.8069 8635	.7773 9752
5.50	.9045 4484	.8792 9083	.8530 3895	.8261 2989	.7988 4008
5.55	.9151 0516	.8922 7293	.8684 1188	.8438 2612	.8187 6514
5.60	.9246 7826	.9041 0362	.8824 9332	.8601 1708	.8371 9839
5.65	.9333 2919	.9148 4815	.8953 4407	.8750 5477	.8541 7905
5.70	.9411 2291	.9245 7390	.9070 2979	.8886 9910	.8697 5754
5.75	.9481 2355	.9333 4919	.9176 1933	.9011 1589	.8839 9324
5.80	.9543 9367	.9412 4222	.9271 8340	.9123 7514	.8969 5235
5.85	.9599 9375	.9483 2021	.9357 9327	.9225 4943	.9087 0596
5.90	.9649 8170	.9546 4865	.9435 1977	.9317 1251	.9193 2837
5.95	.9694 1260	.9602 9074	.9504 3236	.9399 3812	.9288 9546
6.00	.9733 3844	.9653 0692	.9565 9844	.9472 9895	.9374 8344
6.05	.9768 0796	.9697 5455	.9620 8280	.9538 6583	.9451 6772
6.10	.9798 6662	.9736 8765	.9669 4713	.9597 0705	.9520 2195
6.15	.9825 5654	.9771 5679	.9712 4977	.9648 8785	.9581 1729
6.20	.9849 1658	.9802 0902	.9750 4548	.9694 7006	.9635 2185
6.25	.9869 8240	.9828 8785	.9783 8531	.9735 1180	.9683 0025
6.30	.9887 8657	.9852 3333	.9813 1659	.9770 6738	.9725 1332
6.35	.9903 5875	.9872 8211	.9838 8297	.9801 8719	.9762 1792
6.40	.9917 2577	.9890 6763	.9861 2445	.9829 1775	.9794 6686
6.45	.9929 1187	.9906 2023	.9880 7756	.9853 0176	.9823 0888
6.50	.9939 3883	.9919 6730	.9897 7549	.9873 7819	.9847 8874
6.55	.9948 2618	.9931 3354	.9912 4824	.9891 8248	.9869 4731
6.60	.9955 9135	.9941 4109	.9925 2285	.9907 4670	.9888 2175
6.65	.9962 4984	.9950 0973	.9936 2361	.9920 9975	.9904 4566
6.70	.9968 1542	.9957 5708	.9945 7220	.9932 6756	.9918 4933
6.75	.9973 0027	.9963 9879	.9953 8796	.9942 7332	.9930 5992
6.80	.9977 1511	.9969 4870	.9960 8805	.9951 3767	.9941 0170
6.85	.9980 6940	.9974 1903	.9966 8766	.9958 7896	.9949 9630
6.90	.9983 7142	.9978 2054	.9972 0021	.9965 1342	.9957 6290
6.95	.9986 2841	.9981 6264	.9976 3748	.9970 5535	.9964 1846
7.00	.9988 4669	.9984 5359	.9980 0982	.9975 1733	.9969 7792
7.05	.9990 3177	.9987 0058	.9983 2626	.9979 1040	.9974 5443
7.10	.9991 8843	.9989 0988	.9985 9471	.9982 4419	.9978 5948
7.15	.9993 2079	.9990 8692	.9988 2203	.9985 2712	.9982 0314
7.20	.9994 3244	.9992 3642	.9990 1417	.9987 6649	.9984 9415
7.25	.9995 2646	.9993 6244	.9991 7628	.9989 6864	.9987 4013
7.30	.9996 0551	.9994 6848	.9993 1282	.9991 3905	.9989 4765
7.35	.9996 7185	.9995 5757	.9994 2763	.9992 8245	.9991 2241
7.40	.9997 2744	.9996 3228	.9995 2399	.9994 0291	.9992 6933
7.45	.9997 7395	.9996 9484	.9996 0474	.9995 0392	.9993 9262
7.50	.9998 1279	.9997 4713	.9996 7229	.9995 8848	.9994 9590

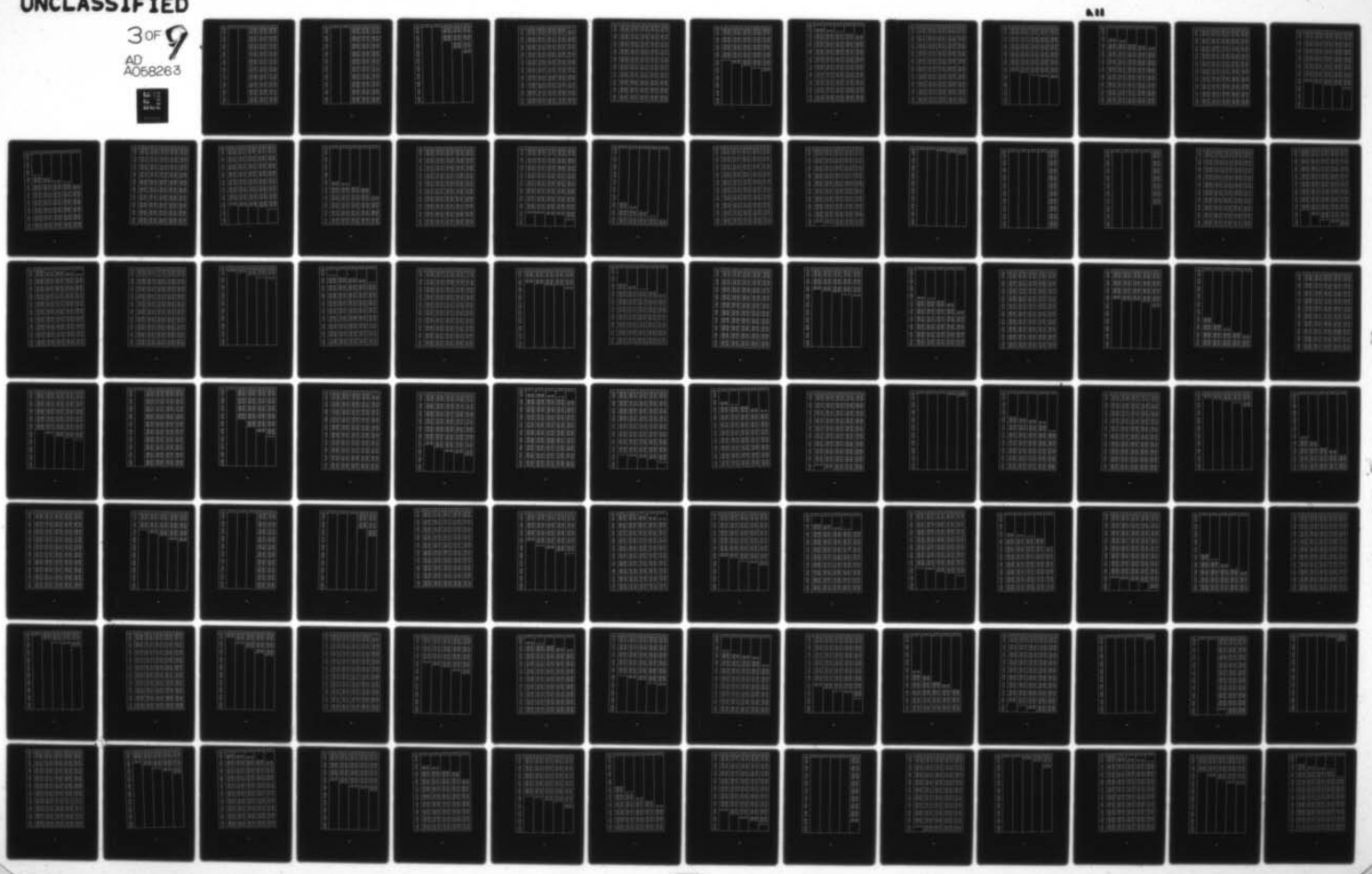
W_0	$P(W_0, .60)$	$P(W_0, .70)$	$P(W_0, .80)$	$P(W_0, .90)$	$P(W_0, .100)$
7.55	.9998 4519	.9997 9077	.9997 2871	.9996 5915	.9995 8226
7.60	.9998 7217	.9998 2714	.9997 7574	.9997 1812	.9996 5437
7.65	.9998 9459	.9998 5739	.9998 1490	.9997 6723	.9997 1447
7.70	.9999 1321	.9998 8252	.9998 4745	.9998 0807	.9997 6447
7.75	.9999 2864	.9999 0336	.9998 7446	.9998 4199	.9998 0601
7.80	.9999 4141	.9999 2062	.9998 9683	.9998 7010	.9998 4046
7.85	.9999 5196	.9999 3488	.9999 1534	.9998 9336	.9998 6899
7.90	.9999 6066	.9999 4666	.9999 3063	.9999 1259	.9998 9257
7.95	.9999 6784	.9999 5637	.9999 4324	.9999 2845	.9999 1204
8.00	.9999 7374	.9999 6436	.9999 5362	.9999 4152	.9999 2808
8.05	.9999 7858	.9999 7093	.9999 6216	.9999 5227	.9999 4128
8.10	.9999 8256	.9999 7632	.9999 6916	.9999 6110	.9999 5213
8.15	.9999 8582	.9999 8074	.9999 7491	.9999 6834	.9999 6103
8.20	.9999 8848	.9999 8435	.9999 7961	.9999 7426	.9999 6832
8.25	.9999 9066	.9999 8731	.9999 8346	.9999 7911	.9999 7428
8.30	.9999 9243	.9999 8972	.9999 8659	.9999 8307	.9999 7915
8.35	.9999 9388	.9999 9168	.9999 8915	.9999 8630	.9999 8312
8.40	.9999 9506	.9999 9328	.9999 9123	.9999 8892	.9999 8635
8.45	.9999 9601	.9999 9458	.9999 9292	.9999 9106	.9999 8898
8.50	.9999 9679	.9999 9563	.9999 9430	.9999 9279	.9999 9111
8.55	.9999 9741	.9999 9648	.9999 9541	.9999 9420	.9999 9284
8.60	.9999 9792	.9999 9717	.9999 9631	.9999 9533	.9999 9425
8.65	.9999 9833	.9999 9773	.9999 9704	.9999 9625	.9999 9538
8.70	.9999 9866	.9999 9818	.9999 9762	.9999 9700	.9999 9629
8.75	.9999 9893	.9999 9854	.9999 9810	.9999 9759	.9999 9703
8.80	.9999 9914	.9999 9884	.9999 9848	.9999 9808	.9999 9763
8.85	.9999 9932	.9999 9907	.9999 9879	.9999 9846	.9999 9810
8.90	.9999 9946	.9999 9926	.9999 9903	.9999 9877	.9999 9849
8.95	.9999 9957	.9999 9941	.9999 9923	.9999 9902	.9999 9879
9.00	.9999 9966	.9999 9953	.9999 9939	.9999 9922	.9999 9904
9.05	.9999 9973	.9999 9963	.9999 9951	.9999 9938	.9999 9924
9.10	.9999 9978	.9999 9970	.9999 9961	.9999 9951	.9999 9940
9.15	.9999 9983	.9999 9977	.9999 9969	.9999 9961	.9999 9952
9.20	.9999 9986	.9999 9981	.9999 9976	.9999 9969	.9999 9962
9.25	.9999 9989	.9999 9985	.9999 9981	.9999 9976	.9999 9970
9.30	.9999 9992	.9999 9988	.9999 9985	.9999 9981	.9999 9976
9.35	.9999 9993	.9999 9991	.9999 9988	.9999 9985	.9999 9981
9.40	.9999 9995	.9999 9993	.9999 9991	.9999 9988	.9999 9985
9.45	.9999 9996	.9999 9994	.9999 9993	.9999 9991	.9999 9988
9.50	.9999 9997	.9999 9996	.9999 9994	.9999 9993	.9999 9991
9.55	.9999 9997	.9999 9997	.9999 9995	.9999 9994	.9999 9993
9.60	.9999 9998	.9999 9997	.9999 9996	.9999 9995	.9999 9994
9.65	.9999 9998	.9999 9998	.9999 9997	.9999 9996	.9999 9996
9.70	.9999 9999	.9999 9998	.9999 9998	.9999 9997	.9999 9997
9.75	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9997
9.80	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9998
9.85	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
9.90	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9999
9.95		1.0000 0000	.9999 9999	.9999 9999	.9999 9999
10.00			1.0000 0000	.9999 9999	.9999 9999

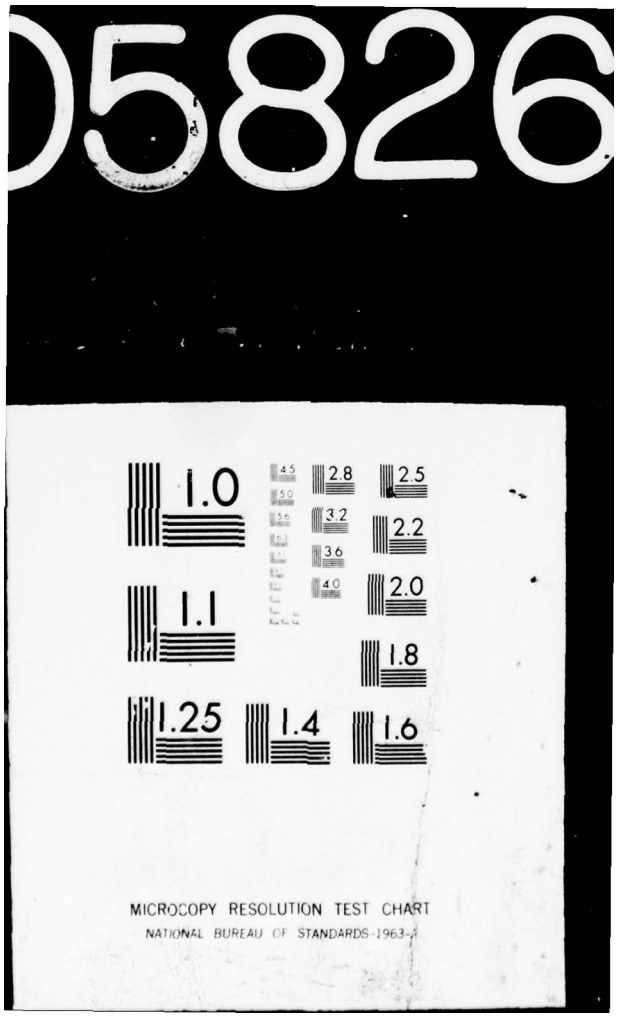
W_0	$P(W_0,60)$	$P(W_0,70)$	$P(W_0,80)$	$P(W_0,90)$	$P(W_0,100)$
10.05				1.0000 0000	.9999 9999
10.10					1.0000 0000
10.15					
10.20					
10.25					
10.30					
10.35					
10.40					
10.45					
10.50					
10.55					
10.60					
10.65					
10.70					
10.75					
10.80					
10.85					
10.90					
10.95					
11.00					
11.05					
11.10					
11.15					
11.20					
11.25					
11.30					
11.35					
11.40					
11.45					
11.50					
11.55					
11.60					
11.65					
11.70					
11.75					
11.80					
11.85					
11.90					
11.95					
12.00					
12.05					
12.10					
12.15					
12.20					
12.25					
12.30					
12.35					
12.40					
12.45					
12.50					

AD-A058 263 AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OHIO F/G 12/1
ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION. VOLUM--ETC(U)
1970 H L HARTER

UNCLASSIFIED

3 OF 9
AD A058263




05826
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1.6
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2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

W_1	$P(W_1, 2)$	$P(W_1, 3)$	$P(W_1, 4)$	$P(W_1, 5)$	$P(W_1, 6)$
0.05			.0649 3826	.0028 1182	.0001 0058
0.10			.1271 0708	.0109 2660	.0007 7877
0.15			.1865 0387	.0238 6083	.0025 4035
0.20			.2431 3674	.0411 3110	.0058 1231
0.25			.2970 2406	.0622 5814	.0109 4343
0.30			.3481 9391	.0867 7058	.0182 0600
0.35			.3966 8349	.1142 0847	.0277 9868
0.40			.4425 3847	.1441 2649	.0398 5018
0.45			.4858 1234	.1760 9676	.0544 2387
0.50			.5265 6569	.2097 1139	.0715 2295
0.55			.5648 6549	.2445 8458	.0910 9630
0.60			.6007 8437	.2803 5438	.1130 4457
0.65			.6343 9986	.3166 8409	.1372 2664
0.70			.6657 9365	.3532 6328	.1634 6617
0.75			.6950 5089	.3898 0841	.1915 5818
0.80			.7222 5944	.4260 6323	.2212 7538
0.85			.7475 0923	.4617 9870	.2523 7449
0.90			.7708 9156	.4968 1274	.2846 0202
0.95			.7924 9849	.5309 2967	.3176 9981
1.00			.8124 2225	.5639 9936	.3514 1002
1.05			.8307 5467	.5958 9624	.3854 7966
1.10			.8475 8670	.6265 1810	.4196 6450
1.15			.8630 0794	.6557 8471	.4537 3252
1.20			.8771 0620	.6836 3635	.4874 6671
1.25			.8899 6716	.7100 3228	.5206 6731
1.30			.9016 7401	.7349 4908	.5531 5351
1.35			.9123 0721	.7583 7901	.5847 6466
1.40			.9219 4423	.7803 2833	.6153 6092
1.45			.9306 5937	.8008 1566	.6448 2353
1.50			.9385 2361	.8198 7038	.6730 5461
1.55			.9456 0450	.8375 3101	.6999 7668
1.60			.9519 6608	.8538 4381	.7255 3183
1.65			.9576 6888	.8688 6127	.7496 8063
1.70			.9627 6986	.8826 4085	.7724 0085
1.75			.9673 2246	.8952 4374	.7936 8609
1.80			.9713 7665	.9067 3375	.8135 4417
1.85			.9749 7901	.9171 7627	.8319 9559
1.90			.9781 7279	.9266 3740	.8490 7187
1.95			.9809 9803	.9351 8316	.8648 1397
2.00			.9834 9170	.9428 7874	.8792 7070
2.05			.9856 8780	.9497 8800	.8924 9719
2.10			.9876 1752	.9559 7288	.9045 5351
2.15			.9893 0937	.9614 9309	.9155 0331
2.20			.9907 8934	.9664 0570	.9254 1258
2.25			.9920 8107	.9707 6497	.9343 4864
2.30			.9932 0596	.9746 2216	.9423 7905
2.35			.9941 8335	.9780 2537	.9495 7088
2.40			.9950 3067	.9810 1957	.9559 8987
2.45			.9957 6356	.9836 4651	.9616 9992
2.50			.9963 9605	.9859 4481	.9667 6252

W_1	$P(W_1,2)$	$P(W_1,3)$	$P(W_1,4)$	$P(W_1,5)$	$P(W_1,6)$
2.55			.9969 4064	.9879 5002	.9712 3640
2.60			.9974 0850	.9896 9469	.9751 7724
2.65			.9978 0952	.9912 0849	.9786 3740
2.70			.9981 5246	.9925 1841	.9816 6588
2.75			.9984 4507	.9936 4882	.9843 0820
2.80			.9986 9416	.9946 2167	.9866 0641
2.85			.9989 0572	.9954 5669	.9885 9915
2.90			.9990 8500	.9961 7146	.9903 2172
2.95			.9992 3657	.9967 8169	.9918 0622
3.00			.9993 6443	.9973 0126	.9930 8170
3.05			.9994 7202	.9977 4248	.9941 7430
3.10			.9995 6236	.9981 1617	.9951 0746
3.15			.9996 3804	.9984 3183	.9959 0210
3.20			.9997 0129	.9986 9777	.9965 7678
3.25			.9997 5403	.9989 2125	.9971 4795
3.30			.9997 9791	.9991 0854	.9976 3009
3.35			.9998 3433	.9992 6510	.9980 3590
3.40			.9998 6448	.9993 9564	.9983 7649
3.45			.9998 8939	.9995 0419	.9986 6152
3.50			.9999 0993	.9995 9423	.9988 9939
3.55			.9999 2681	.9996 6873	.9990 9734
3.60			.9999 4067	.9997 3019	.9992 6160
3.65			.9999 5200	.9997 8079	.9993 9753
3.70			.9999 6126	.9998 2233	.9995 0971
3.75			.9999 6880	.9998 5634	.9996 0202
3.80			.9999 7494	.9998 8412	.9996 7778
3.85			.9999 7991	.9999 0675	.9997 3979
3.90			.9999 8393	.9999 2515	.9997 9040
3.95			.9999 8717	.9999 4006	.9998 3159
4.00			.9999 8979	.9999 5211	.9998 6503
4.05			.9999 9189	.9999 6184	.9998 9211
4.10			.9999 9357	.9999 6966	.9999 1397
4.15			.9999 9491	.9999 7593	.9999 3158
4.20			.9999 9599	.9999 8096	.9999 4572
4.25			.9999 9684	.9999 8497	.9999 5704
4.30			.9999 9752	.9999 8816	.9999 6609
4.35			.9999 9806	.9999 9070	.9999 7330
4.40			.9999 9848	.9999 9271	.9999 7903
4.45			.9999 9881	.9999 9430	.9999 8357
4.50			.9999 9908	.9999 9556	.9999 8716
4.55			.9999 9928	.9999 9654	.9999 8999
4.60			.9999 9944	.9999 9732	.9999 9221
4.65			.9999 9957	.9999 9792	.9999 9396
4.70			.9999 9967	.9999 9839	.9999 9533
4.75			.9999 9975	.9999 9876	.9999 9639
4.80			.9999 9980	.9999 9905	.9999 9722
4.85			.9999 9985	.9999 9927	.9999 9787
4.90			.9999 9989	.9999 9944	.9999 9836
4.95			.9999 9991	.9999 9957	.9999 9875
5.00			.9999 9993	.9999 9968	.9999 9905

W_1	$P(W_1,2)$	$P(W_1,3)$	$P(W_1,4)$	$P(W_1,5)$	$P(W_1,6)$
5.05			.9999 9995	.9999 9975	.9999 9927
5.10			.9999 9996	.9999 9981	.9999 9945
5.15			.9999 9997	.9999 9986	.9999 9958
5.20			.9999 9998	.9999 9989	.9999 9969
5.25			.9999 9998	.9999 9992	.9999 9976
5.30			.9999 9999	.9999 9994	.9999 9982
5.35			.9999 9999	.9999 9995	.9999 9987
5.40			.9999 9999	.9999 9997	.9999 9990
5.45			.9999 9999	.9999 9997	.9999 9993
5.50			1.0000 0000	.9999 9998	.9999 9994
5.55				.9999 9999	.9999 9996
5.60				.9999 9999	.9999 9997
5.65				.9999 9999	.9999 9998
5.70				.9999 9999	.9999 9998
5.75				1.0000 0000	.9999 9999
5.80					.9999 9999
5.85					.9999 9999
5.90					1.0000 0000
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_1	$P(W_1, 7)$	$P(W_1, 8)$	$P(W_1, 9)$	$P(W_1, 10)$	$P(W_1, 11)$
0.05	.0000 0321	.0000 0010	.0000 0000	.0000 0000	
0.10	.0000 4961	.0000 0293	.0000 0016	.0000 0001	.0000 0000
0.15	.0002 4211	.0000 2142	.0000 0180	.0000 0014	.0000 0001
0.20	.0007 3638	.0000 8666	.0000 0967	.0000 0104	.0000 0011
0.25	.0017 2734	.0002 5346	.0000 3528	.0000 0472	.0000 0061
0.30	.0034 3591	.0006 0332	.0001 0053	.0000 1610	.0000 0250
0.35	.0060 9650	.0012 4507	.0002 4142	.0000 4500	.0000 0813
0.40	.0099 4533	.0023 1344	.0005 1121	.0001 0862	.0000 2238
0.45	.0152 0997	.0039 6577	.0009 8280	.0002 3428	.0000 5416
0.50	.0221 0013	.0063 7722	.0017 5006	.0004 6213	.0001 1838
0.55	.0307 9994	.0097 3487	.0029 2787	.0008 4768	.0002 3813
0.60	.0414 6172	.0142 3103	.0046 5090	.0014 6375	.0004 4711
0.65	.0542 0128	.0200 5626	.0070 7103	.0024 0172	.0007 9196
0.70	.0690 9482	.0273 9224	.0103 5367	.0037 7184	.0013 3438
0.75	.0861 7722	.0364 0503	.0146 7300	.0057 0247	.0021 5280
0.80	.1054 4178	.0472 3889	.0202 0651	.0083 3820	.0033 4337
0.85	.1268 4120	.0600 1091	.0271 2895	.0118 3684	.0050 2012
0.90	.1502 8967	.0748 0668	.0356 0617	.0163 6552	.0073 1406
0.95	.1756 6594	.0916 7704	.0457 8893	.0220 9574	.0103 7138
1.00	.2028 1712	.1106 3609	.0578 0717	.0291 9797	.0143 5045
1.05	.2315 6315	.1316 6039	.0717 6488	.0378 3571	.0194 1794
1.10	.2617 0162	.1546 8933	.0877 3576	.0481 5956	.0257 4399
1.15	.2930 1287	.1796 2670	.1057 5992	.0603 0136	.0334 9685
1.20	.3252 6517	.2063 4314	.1258 4175	.0743 6882	.0428 3698
1.25	.3582 1979	.2346 7954	.1479 4883	.0904 4087	.0539 1107
1.30	.3916 3597	.2644 5110	.1720 1219	.1085 6381	.0668 4621
1.35	.4252 7543	.2954 5193	.1979 2762	.1287 4864	.0817 4447
1.40	.4589 0661	.3274 5998	.2255 5802	.1509 6950	.0986 7811
1.45	.4923 0837	.3602 4213	.2547 3673	.1751 6330	.1176 8586
1.50	.5252 7314	.3935 5931	.2852 7161	.2012 3063	.1387 7007
1.55	.5576 0956	.4271 7146	.3169 4966	.2290 3774	.1618 9527
1.60	.5891 4456	.4608 4218	.3495 4215	.2584 1963	.1869 8790
1.65	.6197 2482	.4943 4299	.3828 0980	.2891 8399	.2139 3727
1.70	.6492 1773	.5274 5714	.4165 0817	.3211 1585	.2425 9786
1.75	.6775 1184	.5599 8284	.4503 9276	.3539 8273	.2727 9257
1.80	.7045 1683	.5917 3587	.4842 2391	.3875 4019	.3043 1702
1.85	.7301 6308	.6225 5167	.5177 7123	.4215 3735	.3369 4446
1.90	.7544 0087	.6522 8669	.5508 1751	.4557 2242	.3704 3139
1.95	.7771 9927	.6808 1930	.5831 6208	.4898 4795	.4045 2327
2.00	.7985 4482	.7080 5004	.6146 2343	.5236 7561	.4389 6052
2.05	.8184 3998	.7339 0143	.6450 4130	.5569 8053	.4734 8425
2.10	.8369 0148	.7583 1729	.6742 7797	.5895 5488	.5078 4171
2.15	.8539 5862	.7812 6175	.7022 1901	.6212 1089	.5417 9130
2.20	.8696 5147	.8027 1789	.7287 7339	.6517 8306	.5751 0695
2.25	.8840 2915	.8226 8616	.7538 7307	.6811 2968	.6075 8173
2.30	.8971 4812	.8411 8261	.7774 7213	.7091 3363	.6390 3083
2.35	.9090 7056	.8582 3705	.7995 4547	.7357 0250	.6692 9361
2.40	.9198 6287	.8738 9109	.8200 8728	.7607 6825	.6982 3496
2.45	.9295 9425	.8881 9627	.8391 0914	.7842 8611	.7257 4587
2.50	.9383 3545	.9012 1212	.8566 3807	.8062 3332	.7517 4329

W_1	$P(W_1, .7)$	$P(W_1, .8)$	$P(W_1, .9)$	$P(W_1, .10)$	$P(W_1, .11)$
2.55	.9461 5765	.9130 0438	.8727 1445	.8266 0729	.7761 6946
2.60	.9531 3148	.9236 4335	.8873 8992	.8454 2365	.7989 9056
2.65	.9593 2617	.9332 0227	.9007 2524	.8627 1404	.8201 9509
2.70	.9648 0889	.9417 5597	.9127 8837	.8785 2390	.8397 9179
2.75	.9696 4413	.9493 7961	.9236 5252	.8929 1010	.8578 0738
2.80	.9738 9334	.9561 4759	.9333 9441	.9059 3875	.8742 8418
2.85	.9776 1452	.9621 3267	.9420 9270	.9176 8303	.8892 7759
2.90	.9808 6206	.9674 0518	.9498 2660	.9282 2116	.9028 5367
2.95	.9836 8660	.9720 3246	.9566 7462	.9376 3452	.9150 8675
3.00	.9861 3496	.9760 7835	.9627 1356	.9460 0604	.9260 5718
3.05	.9882 5016	.9796 0292	.9680 1768	.9534 1870	.9358 4931
3.10	.9900 7149	.9826 6221	.9726 5800	.9599 5430	.9445 4953
3.15	.9916 3466	.9853 0811	.9767 0177	.9656 9238	.9522 4474
3.20	.9929 7192	.9875 8840	.9802 1215	.9707 0942	.9590 2082
3.25	.9941 1223	.9895 4670	.9832 4797	.9750 7814	.9649 6153
3.30	.9950 8152	.9912 2267	.9858 6355	.9788 6705	.9701 4752
3.35	.9959 0284	.9926 5210	.9881 0875	.9821 4009	.9746 5554
3.40	.9965 9659	.9938 6713	.9900 2899	.9849 5647	.9785 5793
3.45	.9971 8078	.9948 9645	.9916 6540	.9873 7057	.9819 2223
3.50	.9976 7119	.9957 6555	.9930 5496	.9894 3200	.9848 1094
3.55	.9980 8162	.9964 9696	.9942 3075	.9911 8569	.9872 8143
3.60	.9984 2408	.9971 1050	.9952 2222	.9926 7206	.9893 8599
3.65	.9987 0895	.9976 2348	.9960 5536	.9939 2727	.9911 7188
3.70	.9989 4522	.9980 5104	.9967 5310	.9949 8343	.9926 8158
3.75	.9991 4060	.9984 0625	.9973 3546	.9958 6895	.9939 5303
3.80	.9993 0168	.9987 0045	.9978 1991	.9966 0878	.9950 1983
3.85	.9994 3411	.9989 4334	.9982 2157	.9972 2475	.9959 1166
3.90	.9995 4265	.9991 4326	.9985 5351	.9977 3582	.9966 5452
3.95	.9996 3136	.9993 0730	.9988 2695	.9981 5841	.9972 7109
4.00	.9997 0366	.9994 4150	.9990 5147	.9985 0667	.9977 8102
4.05	.9997 6241	.9995 5095	.9992 3523	.9987 9272	.9982 0130
4.10	.9998 1002	.9996 3995	.9993 8517	.9990 2689	.9985 4649
4.15	.9998 4849	.9997 1210	.9995 0712	.9992 1796	.9988 2904
4.20	.9998 7949	.9997 7043	.9996 0601	.9993 7337	.9990 5954
4.25	.9999 0439	.9998 1743	.9996 8595	.9994 9937	.9992 4695
4.30	.9999 2435	.9998 5521	.9997 5037	.9996 0119	.9993 9882
4.35	.9999 4030	.9998 8548	.9998 0213	.9996 8322	.9995 2150
4.40	.9999 5300	.9999 0966	.9998 4360	.9997 4910	.9996 2026
4.45	.9999 6310	.9999 2893	.9998 7672	.9998 0185	.9996 9953
4.50	.9999 7111	.9999 4424	.9999 0309	.9998 4395	.9997 6294
4.55	.9999 7743	.9999 5637	.9999 2403	.9998 7745	.9998 1352
4.60	.9999 8242	.9999 6595	.9999 4061	.9999 0403	.9998 5372
4.65	.9999 8634	.9999 7349	.9999 5369	.9999 2505	.9998 8559
4.70	.9999 8941	.9999 7942	.9999 6399	.9999 4163	.9999 1076
4.75	.9999 9181	.9999 8406	.9999 7208	.9999 5467	.9999 3060
4.80	.9999 9369	.9999 8769	.9999 7840	.9999 6489	.9999 4617
4.85	.9999 9514	.9999 9052	.9999 8334	.9999 7288	.9999 5837
4.90	.9999 9627	.9999 9272	.9999 8718	.9999 7911	.9999 6789
4.95	.9999 9715	.9999 9442	.9999 9017	.9999 8395	.9999 7531
5.00	.9999 9782	.9999 9573	.9999 9247	.9999 8771	.9999 8106

W_1	$P(W_1,7)$	$P(W_1,8)$	$P(W_1,9)$	$P(W_1,10)$	$P(W_1,11)$
5.05	.9999 9834	.9999 9675	.9999 9426	.9999 9061	.9999 8551
5.10	.9999 9874	.9999 9753	.9999 9563	.9999 9284	.9999 8895
5.15	.9999 9905	.9999 9812	.9999 9668	.9999 9456	.9999 9159
5.20	.9999 9928	.9999 9858	.9999 9749	.9999 9588	.9999 9362
5.25	.9999 9946	.9999 9893	.9999 9810	.9999 9688	.9999 9517
5.30	.9999 9959	.9999 9919	.9999 9857	.9999 9765	.9999 9636
5.35	.9999 9969	.9999 9939	.9999 9892	.9999 9823	.9999 9726
5.40	.9999 9977	.9999 9955	.9999 9919	.9999 9867	.9999 9794
5.45	.9999 9983	.9999 9966	.9999 9940	.9999 9901	.9999 9846
5.50	.9999 9987	.9999 9975	.9999 9955	.9999 9926	.9999 9885
5.55	.9999 9991	.9999 9981	.9999 9967	.9999 9945	.9999 9914
5.60	.9999 9993	.9999 9986	.9999 9975	.9999 9959	.9999 9936
5.65	.9999 9995	.9999 9990	.9999 9982	.9999 9970	.9999 9953
5.70	.9999 9996	.9999 9992	.9999 9986	.9999 9978	.9999 9965
5.75	.9999 9997	.9999 9994	.9999 9990	.9999 9983	.9999 9974
5.80	.9999 9998	.9999 9996	.9999 9993	.9999 9988	.9999 9981
5.85	.9999 9998	.9999 9997	.9999 9995	.9999 9991	.9999 9986
5.90	.9999 9999	.9999 9998	.9999 9996	.9999 9993	.9999 9990
5.95	.9999 9999	.9999 9998	.9999 9997	.9999 9995	.9999 9993
6.00	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9995
6.05	1.0000 0000	.9999 9999	.9999 9998	.9999 9997	.9999 9996
6.10		.9999 9999	.9999 9999	.9999 9998	.9999 9997
6.15		1.0000 0000	.9999 9999	.9999 9999	.9999 9998
6.20			.9999 9999	.9999 9999	.9999 9999
6.25			1.0000 0000	.9999 9999	.9999 9999
6.30				1.0000 0000	.9999 9999
6.35					.9999 9999
6.40					1.0000 0000
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_1	$P(W_1, .12)$	$P(W_1, .13)$	$P(W_1, .14)$	$P(W_1, .15)$	$P(W_1, .16)$
0.05					
0.10					
0.15	.0000 0000				
0.20	.0000 0001	.0000 0000			
0.25	.0000 0008	.0000 0001	.0000 0000		
0.30	.0000 0038	.0000 0006	.0000 0001	.0000 0000	
0.35	.0000 0143	.0000 0025	.0000 0004	.0000 0001	.0000 0000
0.40	.0000 0450	.0000 0089	.0000 0017	.0000 0003	.0000 0001
0.45	.0000 1222	.0000 0270	.0000 0059	.0000 0013	.0000 0003
0.50	.0000 2959	.0000 0725	.0000 0174	.0000 0041	.0000 0010
0.55	.0000 6528	.0000 1754	.0000 0463	.0000 0121	.0000 0031
0.60	.0001 3330	.0000 3895	.0000 1119	.0000 0317	.0000 0089
0.65	.0002 5493	.0000 8044	.0000 2496	.0000 0763	.0000 0231
0.70	.0004 6093	.0001 5609	.0000 5198	.0000 1707	.0000 0553
0.75	.0007 9371	.0002 8693	.0001 0202	.0000 3576	.0000 1238
0.80	.0013 0953	.0005 0301	.0001 9005	.0000 7080	.0000 2606
0.85	.0020 8022	.0008 4549	.0003 3807	.0001 3330	.0000 5192
0.90	.0031 9455	.0013 6881	.0005 7707	.0002 3993	.0000 9856
0.95	.0047 5881	.0021 4250	.0009 4920	.0004 1477	.0001 7909
1.00	.0068 9648	.0032 5263	.0015 0981	.0006 9131	.0003 1280
1.05	.0097 4706	.0048 0262	.0023 2933	.0011 1454	.0005 2704
1.10	.0134 6370	.0069 1321	.0034 9473	.0017 4306	.0008 5929
1.15	.0182 0990	.0097 2152	.0051 1038	.0026 5090	.0013 5927
1.20	.0241 5518	.0133 7908	.0072 9812	.0039 2896	.0020 9104
1.25	.0314 7005	.0180 4875	.0101 9638	.0056 8576	.0031 3472
1.30	.0403 2026	.0239 0069	.0139 5825	.0080 4748	.0045 8784
1.35	.0508 6083	.0311 0744	.0187 4848	.0111 5693	.0065 6594
1.40	.0632 2991	.0398 3822	.0247 3945	.0151 7149	.0092 0231
1.45	.0775 4297	.0502 5291	.0321 0616	.0202 5995	.0126 4672
1.50	.0938 8749	.0624 9572	.0410 2050	.0265 9821	.0170 6301
1.55	.1123 1843	.0766 8910	.0516 4500	.0343 6413	.0226 2555
1.60	.1328 5472	.0929 2802	.0641 2637	.0437 3148	.0295 1454
1.65	.1554 7702	.1112 7506	.0785 8912	.0548 6345	.0379 1046
1.70	.1801 2668	.1317 5645	.0951 2962	.0679 0600	.0479 8769
1.75	.2067 0606	.1543 5932	.1138 1097	.0829 8126	.0599 0766
1.80	.2350 8029	.1790 3032	.1346 5876	.1001 8144	.0738 1197
1.85	.2650 8008	.2056 7561	.1576 5825	.1195 6362	.0898 1566
1.90	.2965 0576	.2341 6231	.1827 5280	.1411 4558	.1080 0112
1.95	.3291 3214	.2643 2122	.2098 4389	.1649 0294	.1284 1291
2.00	.3627 1415	.2959 5083	.2387 9261	.1907 6795	.1510 5393
2.05	.3969 9280	.3288 2229	.2694 2254	.2186 2966	.1758 8287
2.10	.4317 0145	.3626 8513	.3015 2399	.2483 3583	.2028 1348
2.15	.4665 7200	.3972 7361	.3348 5919	.2796 9624	.2317 1536
2.20	.5013 4082	.4323 1323	.3691 6841	.3124 8730	.2624 1648
2.25	.5357 5426	.4675 2733	.4041 7664	.3464 5783	.2947 0714
2.30	.5695 7355	.5026 4342	.4396 0044	.3813 3562	.3283 4533
2.35	.6025 7893	.5373 9900	.4751 5493	.4168 3445	.3630 6308
2.40	.6345 7306	.5715 4690	.5105 6035	.4526 6146	.3985 7359
2.45	.6653 8350	.6048 5968	.5455 4825	.4885 2434	.4345 7879
2.50	.6948 6434	.6371 3329	.5798 6694	.5241 3819	.4707 7699

W_1	$P(W_1, .12)$	$P(W_1, .13)$	$P(W_1, .14)$	$P(W_1, .15)$	$P(W_1, .16)$
2.55	.7228 9709	.6681 8972	.6132 8605	.5592 3176	.5068 7036
2.60	.7493 9068	.6978 7886	.6456 0023	.5935 5297	.5425 7182
2.65	.7742 8080	.7260 7929	.6766 3182	.6268 7341	.5776 1132
2.70	.7975 2875	.7526 9838	.7062 3257	.6589 9187	.6117 4111
2.75	.8191 1958	.7776 7158	.7342 8437	.6897 3679	.6447 4003
2.80	.8390 6008	.8009 6107	.7606 9911	.7189 6772	.6764 1664
2.85	.8573 7631	.8225 5386	.7854 1775	.7465 7567	.7066 1126
2.90	.8741 1103	.8424 5952	.8084 0877	.7724 8268	.7351 9690
2.95	.8893 2111	.8607 0762	.8296 6604	.7966 4051	.7620 7920
3.00	.9030 7481	.8773 4490	.8492 0625	.8190 2876	.7871 9541
3.05	.9154 4930	.8924 3252	.8670 6613	.8396 5233	.8105 1272
3.10	.9265 2816	.9060 4320	.8832 9951	.8585 3870	.8320 2580
3.15	.9363 9924	.9182 5852	.8979 7425	.8757 3478	.8517 5406
3.20	.9451 5256	.9291 6640	.9111 6935	.8913 0381	.8697 3846
3.25	.9528 7862	.9388 5871	.9229 7206	.9053 2213	.8860 3822
3.30	.9596 6684	.9474 2923	.9334 7530	.9178 7615	.9007 2745
3.35	.9656 0430	.9549 7177	.9427 7527	.9290 5948	.9138 9190
3.40	.9707 7470	.9615 7867	.9509 6930	.9389 7023	.9256 2580
3.45	.9752 5761	.9673 3946	.9581 5405	.9477 0866	.9360 2903
3.50	.9791 2785	.9723 3989	.9644 2400	.9553 7514	.9452 0445
3.55	.9824 5512	.9766 6110	.9698 7015	.9620 6835	.9532 5569
3.60	.9853 0377	.9803 7909	.9745 7915	.9678 8389	.9602 8513
3.65	.9877 3271	.9835 6439	.9786 3248	.9729 1311	.9663 9235
3.70	.9897 9549	.9862 8181	.9821 0604	.9772 4227	.9716 7282
3.75	.9915 4037	.9885 9049	.9850 6986	.9809 5194	.9762 1690
3.80	.9930 1060	.9905 4388	.9875 8795	.9841 1662	.9801 0916
3.85	.9942 4466	.9921 9004	.9897 1837	.9868 0458	.9834 2793
3.90	.9952 7655	.9935 7179	.9915 1336	.9890 7780	.9862 4507
3.95	.9961 3618	.9947 2707	.9930 1959	.9909 9216	.9886 2590
4.00	.9968 4966	.9956 8930	.9942 7845	.9925 9760	.9906 2932
4.05	.9974 3969	.9964 8769	.9953 2642	.9939 3847	.9923 0799
4.10	.9979 2587	.9971 4766	.9961 9544	.9950 5385	.9937 0870
4.15	.9983 2506	.9976 9121	.9969 1332	.9959 7799	.9948 7267
4.20	.9986 5168	.9981 3724	.9975 0410	.9967 4068	.9958 3602
4.25	.9989 1799	.9985 0192	.9979 8847	.9973 6771	.9966 3015
4.30	.9991 3438	.9987 9905	.9983 8415	.9978 8125	.9972 8222
4.35	.9993 0963	.9990 4028	.9987 0620	.9983 0028	.9978 1559
4.40	.9994 5107	.9992 3546	.9989 6739	.9986 4092	.9982 5020
4.45	.9995 6485	.9993 9283	.9991 7848	.9989 1684	.9986 0302
4.50	.9996 5608	.9995 1929	.9993 4847	.9991 3952	.9988 8838
4.55	.9997 2899	.9996 2057	.9994 8490	.9993 1861	.9991 1834
4.60	.9997 8708	.9997 0142	.9995 9402	.9994 6214	.9993 0299
4.65	.9998 3320	.9997 6574	.9996 8101	.9995 7676	.9994 5074
4.70	.9998 6971	.9998 1676	.9997 5012	.9996 6799	.9995 6854
4.75	.9998 9853	.9998 5709	.9998 0485	.9997 4036	.9996 6214
4.80	.9999 2120	.9998 8887	.9998 4805	.9997 9757	.9997 3625
4.85	.9999 3898	.9999 1383	.9998 8204	.9998 4266	.9997 9475
4.90	.9999 5288	.9999 3338	.9999 0869	.9998 7807	.9998 4076
4.95	.9999 6371	.9999 4864	.9999 2953	.9999 0579	.9998 7683
5.00	.9999 7214	.9999 6052	.9999 4577	.9999 2743	.9999 0501

W_1	$P(W_1, 12)$	$P(W_1, 13)$	$P(W_1, 14)$	$P(W_1, 15)$	$P(W_1, 16)$
5.05	.9999 7866	.9999 6974	.9999 5839	.9999 4426	.9999 2697
5.10	.9999 8371	.9999 7687	.9999 6816	.9999 5731	.9999 4401
5.15	.9999 8759	.9999 8237	.9999 7571	.9999 6740	.9999 5721
5.20	.9999 9058	.9999 8660	.9999 8152	.9999 7517	.9999 6739
5.25	.9999 9286	.9999 8984	.9999 8598	.9999 8115	.9999 7522
5.30	.9999 9461	.9999 9232	.9999 8939	.9999 8573	.9999 8122
5.35	.9999 9594	.9999 9421	.9999 9200	.9999 8922	.9999 8581
5.40	.9999 9695	.9999 9565	.9999 9398	.9999 9189	.9999 8931
5.45	.9999 9771	.9999 9674	.9999 9548	.9999 9391	.9999 9197
5.50	.9999 9829	.9999 9756	.9999 9662	.9999 9544	.9999 9398
5.55	.9999 9873	.9999 9818	.9999 9748	.9999 9659	.9999 9550
5.60	.9999 9905	.9999 9865	.9999 9812	.9999 9746	.9999 9665
5.65	.9999 9930	.9999 9900	.9999 9861	.9999 9812	.9999 9751
5.70	.9999 9948	.9999 9926	.9999 9897	.9999 9860	.9999 9815
5.75	.9999 9962	.9999 9945	.9999 9924	.9999 9897	.9999 9864
5.80	.9999 9972	.9999 9960	.9999 9944	.9999 9924	.9999 9899
5.85	.9999 9979	.9999 9970	.9999 9959	.9999 9944	.9999 9926
5.90	.9999 9985	.9999 9978	.9999 9970	.9999 9959	.9999 9946
5.95	.9999 9989	.9999 9984	.9999 9978	.9999 9970	.9999 9960
6.00	.9999 9992	.9999 9988	.9999 9984	.9999 9978	.9999 9971
6.05	.9999 9994	.9999 9992	.9999 9988	.9999 9984	.9999 9979
6.10	.9999 9996	.9999 9994	.9999 9992	.9999 9989	.9999 9985
6.15	.9999 9997	.9999 9996	.9999 9994	.9999 9992	.9999 9989
6.20	.9999 9998	.9999 9997	.9999 9996	.9999 9994	.9999 9992
6.25	.9999 9998	.9999 9998	.9999 9997	.9999 9996	.9999 9994
6.30	.9999 9999	.9999 9998	.9999 9998	.9999 9997	.9999 9996
6.35	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9997
6.40	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9998
6.45	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9999
6.50		1.0000 0000	.9999 9999	.9999 9999	.9999 9999
6.55			1.0000 0000	.9999 9999	.9999 9999
6.60				1.0000 0000	.9999 9999
6.65					1.0000 0000
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_1	$P(W_1, .17)$	$P(W_1, .18)$	$P(W_1, .19)$	$P(W_1, .20)$	$P(W_1, .22)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40	.0000 0000				
0.45	.0000 0001	.0000 0000			
0.50	.0000 0002	.0000 0001			
0.55	.0000 0008	.0000 0002	.0000 0000		
0.60	.0000 0025	.0000 0007	.0000 0002	.0000 0000	
0.65	.0000 0069	.0000 0020	.0000 0006	.0000 0002	.0000 0000
0.70	.0000 0178	.0000 0056	.0000 0018	.0000 0006	.0000 0001
0.75	.0000 0424	.0000 0144	.0000 0048	.0000 0016	.0000 0002
0.80	.0000 0949	.0000 0342	.0000 0122	.0000 0043	.0000 0005
0.85	.0000 2001	.0000 0764	.0000 0289	.0000 0109	.0000 0015
0.90	.0000 4006	.0000 1613	.0000 0644	.0000 0255	.0000 0039
0.95	.0000 7652	.0000 3239	.0000 1360	.0000 0567	.0000 0097
1.00	.0001 4007	.0000 6215	.0000 2735	.0000 1195	.0000 0224
1.05	.0002 4666	.0001 1440	.0000 5262	.0000 2403	.0000 0492
1.10	.0004 1929	.0002 0275	.0000 9725	.0000 4631	.0000 1031
1.15	.0006 8993	.0003 4705	.0001 7318	.0000 8580	.0000 2067
1.20	.0011 0172	.0005 7531	.0002 9805	.0001 5331	.0000 3981
1.25	.0017 1109	.0009 2577	.0004 9694	.0002 6487	.0000 7386
1.30	.0025 8977	.0014 4912	.0008 0454	.0004 4355	.0001 3235
1.35	.0038 2646	.0022 1067	.0012 6730	.0007 2146	.0002 2957
1.40	.0055 2788	.0032 9219	.0019 4568	.0011 4197	.0003 8631
1.45	.0078 1914	.0047 9339	.0029 1622	.0017 6206	.0006 3183
1.50	.0108 4303	.0068 3265	.0042 7322	.0026 5444	.0010 0613
1.55	.0147 5831	.0095 4688	.0061 2983	.0039 0947	.0015 6233
1.60	.0197 3680	.0130 9030	.0086 1831	.0056 3649	.0023 6903
1.65	.0259 5921	.0176 3206	.0118 8922	.0079 6435	.0035 1247
1.70	.0336 0996	.0233 5257	.0161 0947	.0110 4101	.0050 9818
1.75	.0428 7104	.0304 3868	.0214 5904	.0150 3183	.0072 5194
1.80	.0539 1519	.0390 7776	.0281 2651	.0201 1672	.0101 1975
1.85	.0668 9879	.0494 5100	.0363 0334	.0264 8578	.0138 6664
1.90	.0819 5465	.0617 2606	.0461 7718	.0343 3384	.0186 7409
1.95	.0991 8536	.0760 4970	.0579 2456	.0438 5383	.0247 3601
2.00	.1186 5728	.0925 4050	.0717 0316	.0552 2932	.0322 5339
2.05	.1403 9573	.1112 8229	.0876 4421	.0686 2664	.0414 2764
2.10	.1643 8163	.1323 1859	.1058 4536	.0841 8692	.0524 5290
2.15	.1905 4966	.1556 4841	.1263 6456	.1020 1858	.0655 0778
2.20	.2187 8828	.1812 2362	.1492 1510	.1221 9061	.0807 4682
2.25	.2489 4137	.2089 4819	.1743 6241	.1447 2717	.0982 9228
2.30	.2808 1170	.2386 7920	.2017 2259	.1696 0376	.1182 2666
2.35	.3141 6576	.2702 2971	.2311 6288	.1967 4527	.1405 8646
2.40	.3487 3998	.3033 7324	.2625 0410	.2260 2600	.1653 5766
2.45	.3842 4776	.3378 4980	.2955 2483	.2572 7180	.1924 7309
2.50	.4203 8731	.3733 7291	.3299 6724	.2902 6397	.2218 1195

W_1	$P(W_1,17)$	$P(W_1,18)$	$P(W_1,19)$	$P(W_1,20)$	$P(W_1,22)$
2.55	.4568 4957	.4096 3751	.3655 4415	.3247 4509	.2532 0157
2.60	.4933 2619	.4463 2826	.4019 4708	.3604 2603	.2864 2135
2.65	.5295 1706	.4831 2790	.4388 5481	.3969 9429	.3212 0850
2.70	.5651 3714	.5197 2528	.4759 4214	.4341 2270	.3572 6555
2.75	.5999 2251	.5558 2278	.5128 8832	.4714 7863	.3942 6897
2.80	.6336 3522	.5911 4289	.5493 8499	.5087 3277	.4318 7863
2.85	.6660 6709	.6254 3367	.5851 4328	.5455 6755	.4697 4756
2.90	.6970 4224	.6584 7304	.6198 9968	.5816 8456	.5075 3154
2.95	.7264 1856	.6900 7185	.6534 2085	.6168 1097	.5448 9817
3.00	.7540 8791	.7200 7555	.6855 0699	.6507 0455	.5815 3497
3.05	.7799 7545	.7483 6495	.7159 9393	.6831 5741	.6171 5631
3.10	.8040 3805	.7748 5558	.7447 5394	.7139 9831	.6515 0893
3.15	.8262 6199	.7994 9624	.7716 9540	.7430 9358	.6843 7595
3.20	.8466 6016	.8222 6681	.7967 6139	.7703 4690	.7155 7936
3.25	.8652 6878	.8431 7536	.8199 2743	.7956 9790	.7449 8105
3.30	.8821 4402	.8622 5485	.8411 9862	.8191 1986	.7724 8245
3.35	.8973 5848	.8795 5957	.8606 0620	.8406 1676	.7980 2300
3.40	.9109 9766	.8951 6146	.8782 0385	.8602 1970	.8215 7766
3.45	.9231 5670	.9091 4646	.8940 6389	.8779 8309	.8431 5359
3.50	.9339 3724	.9216 1098	.9082 7340	.8939 8066	.8627 8630
3.55	.9434 4464	.9326 5864	.9209 3060	.9083 0145	.8805 3553
3.60	.9517 8549	.9423 9728	.9321 4136	.9210 4601	.8964 8089
3.65	.9590 6553	.9509 3634	.9420 1608	.9323 2276	.9107 1760
3.70	.9653 8782	.9583 8455	.9506 6693	.9422 4481	.9233 5240
3.75	.9708 5139	.9648 4813	.9582 0548	.9509 2698	.9344 9973
3.80	.9755 5014	.9704 2918	.9647 4067	.9584 8344	.9442 7830
3.85	.9795 7202	.9752 2457	.9703 7728	.9650 2559	.9528 0809
3.90	.9829 9858	.9793 2510	.9752 1467	.9706 6044	.9602 0779
3.95	.9859 0465	.9828 1493	.9793 4592	.9754 8936	.9665 9270
4.00	.9883 5826	.9857 7126	.9828 5724	.9796 0720	.9720 7309
4.05	.9904 2078	.9882 6429	.9858 2766	.9831 0168	.9767 5295
4.10	.9921 4705	.9903 5725	.9883 2895	.9860 5310	.9807 2912
4.15	.9935 8577	.9921 0665	.9904 2568	.9885 3426	.9840 9078
4.20	.9947 7984	.9935 6260	.9921 7551	.9906 1058	.9869 1921
4.25	.9957 6680	.9947 6920	.9936 2947	.9923 4033	.9892 8773
4.30	.9965 7927	.9957 6500	.9948 3243	.9937 7503	.9912 6193
4.35	.9972 4546	.9965 8347	.9958 2354	.9949 5988	.9929 0000
4.40	.9977 8956	.9972 5349	.9966 3673	.9959 3423	.9942 5309
4.45	.9982 3223	.9977 9981	.9973 0123	.9967 3214	.9953 6591
4.50	.9985 9103	.9982 4354	.9978 4207	.9973 8290	.9962 7718
4.55	.9988 8075	.9986 0256	.9982 8052	.9979 1150	.9970 2027
4.60	.9991 1384	.9988 9194	.9986 3460	.9983 3917	.9976 2370
4.65	.9993 0068	.9991 2433	.9989 1945	.9986 8384	.9981 1173
4.70	.9994 4991	.9993 1025	.9991 4775	.9989 6055	.9985 0484
4.75	.9995 6868	.9994 5849	.9993 3005	.9991 8186	.9988 2025
4.80	.9996 6288	.9995 7623	.9994 7508	.9993 5820	.9990 7234
4.85	.9997 3733	.9996 6943	.9995 9006	.9994 9820	.9992 7306
4.90	.9997 9598	.9997 4295	.9996 8088	.9996 0894	.9994 3226
4.95	.9998 4202	.9998 0075	.9997 5237	.9996 9623	.9995 5808
5.00	.9998 7805	.9998 4603	.9998 0845	.9997 6479	.9996 5715

W_1	$P(W_1, .17)$	$P(W_1, .18)$	$P(W_1, .19)$	$P(W_1, .20)$	$P(W_1, .22)$
5.05	.9999 0614	.9998 8138	.9998 5229	.9998 1845	.9997 3488
5.10	.9999 2798	.9999 0890	.9998 8645	.9998 6031	.9997 9564
5.15	.9999 4490	.9999 3024	.9999 1298	.9998 9286	.9998 4298
5.20	.9999 5797	.9999 4675	.9999 3351	.9999 1807	.9998 7974
5.25	.9999 6804	.9999 5947	.9999 4935	.9999 3754	.9999 0818
5.30	.9999 7576	.9999 6924	.9999 6153	.9999 5253	.9999 3011
5.35	.9999 8167	.9999 7672	.9999 7087	.9999 6403	.9999 4696
5.40	.9999 8618	.9999 8244	.9999 7801	.9999 7282	.9999 5988
5.45	.9999 8961	.9999 8679	.9999 8344	.9999 7953	.9999 6974
5.50	.9999 9221	.9999 9009	.9999 8757	.9999 8462	.9999 7724
5.55	.9999 9418	.9999 9259	.9999 9070	.9999 8848	.9999 8294
5.60	.9999 9566	.9999 9447	.9999 9306	.9999 9140	.9999 8724
5.65	.9999 9677	.9999 9589	.9999 9483	.9999 9360	.9999 9049
5.70	.9999 9761	.9999 9695	.9999 9616	.9999 9524	.9999 9293
5.75	.9999 9823	.9999 9774	.9999 9716	.9999 9648	.9999 9476
5.80	.9999 9870	.9999 9833	.9999 9791	.9999 9740	.9999 9613
5.85	.9999 9904	.9999 9877	.9999 9846	.9999 9809	.9999 9715
5.90	.9999 9930	.9999 9910	.9999 9887	.9999 9859	.9999 9790
5.95	.9999 9949	.9999 9934	.9999 9917	.9999 9897	.9999 9846
6.00	.9999 9962	.9999 9952	.9999 9940	.9999 9925	.9999 9888
6.05	.9999 9973	.9999 9965	.9999 9956	.9999 9945	.9999 9918
6.10	.9999 9980	.9999 9975	.9999 9968	.9999 9960	.9999 9941
6.15	.9999 9986	.9999 9982	.9999 9977	.9999 9971	.9999 9957
6.20	.9999 9990	.9999 9987	.9999 9983	.9999 9979	.9999 9969
6.25	.9999 9993	.9999 9990	.9999 9988	.9999 9985	.9999 9978
6.30	.9999 9995	.9999 9993	.9999 9991	.9999 9989	.9999 9984
6.35	.9999 9996	.9999 9995	.9999 9994	.9999 9992	.9999 9988
6.40	.9999 9997	.9999 9996	.9999 9996	.9999 9994	.9999 9992
6.45	.9999 9998	.9999 9997	.9999 9997	.9999 9996	.9999 9994
6.50	.9999 9999	.9999 9998	.9999 9998	.9999 9997	.9999 9996
6.55	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9997
6.60	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
6.65	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9999
6.70		1.0000 0000	.9999 9999	.9999 9999	.9999 9999
6.75			1.0000 0000	1.0000 0000	.9999 9999
6.80					.9999 9999
6.85					1.0000 0000
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_1	$P(W_1, .24)$	$P(W_1, .26)$	$P(W_1, .28)$	$P(W_1, .30)$	$P(W_1, .32)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75	.0000 0000				
0.80	.0000 0001				
0.85	.0000 0002	.0000 0000			
0.90	.0000 0006	.0000 0001			
0.95	.0000 0016	.0000 0003	.0000 0000		
1.00	.0000 0041	.0000 0007	.0000 0001	.0000 0000	
1.05	.0000 0098	.0000 0019	.0000 0004	.0000 0001	
1.10	.0000 0224	.0000 0048	.0000 0010	.0000 0002	.0000 0000
1.15	.0000 0487	.0000 0113	.0000 0026	.0000 0006	.0000 0001
1.20	.0000 1012	.0000 0253	.0000 0062	.0000 0015	.0000 0004
1.25	.0000 2017	.0000 0541	.0000 0143	.0000 0037	.0000 0010
1.30	.0000 3867	.0000 1110	.0000 0314	.0000 0088	.0000 0024
1.35	.0000 7154	.0000 2190	.0000 0661	.0000 0197	.0000 0058
1.40	.0001 2800	.0000 4168	.0000 1337	.0000 0423	.0000 0133
1.45	.0002 2194	.0000 7662	.0000 2606	.0000 0875	.0000 0291
1.50	.0003 7364	.0001 3639	.0000 4906	.0000 1742	.0000 0612
1.55	.0006 1182	.0002 3553	.0000 8936	.0000 3348	.0000 1240
1.60	.0009 7590	.0003 9526	.0001 5778	.0000 6220	.0000 2425
1.65	.0015 1856	.0006 4557	.0002 7053	.0001 1196	.0000 4584
1.70	.0023 0815	.0010 2772	.0004 5111	.0001 9558	.0000 8388
1.75	.0034 3106	.0015 9673	.0007 3263	.0003 3206	.0001 4890
1.80	.0049 9355	.0024 2410	.0011 6037	.0005 4873	.0002 5674
1.85	.0071 2290	.0036 0013	.0017 9451	.0008 8376	.0004 3066
1.90	.0099 6754	.0052 3590	.0027 1283	.0013 8887	.0007 0365
1.95	.0136 9598	.0074 6440	.0040 1318	.0021 3227	.0011 2121
2.00	.0184 9430	.0104 4062	.0058 1532	.0032 0137	.0017 4435
2.05	.0245 6209	.0143 4031	.0082 6194	.0047 0518	.0026 5247
2.10	.0321 0693	.0193 5719	.0115 1838	.0067 7596	.0039 4619
2.15	.0413 3743	.0256 9861	.0157 7103	.0095 6980	.0057 4941
2.20	.0524 5522	.0335 7946	.0212 2392	.0132 6587	.0082 1063
2.25	.0656 4617	.0432 1477	.0280 9369	.0180 6395	.0115 0278
2.30	.0810 7134	.0548 1108	.0366 0280	.0241 8022	.0158 2160
2.35	.0988 5817	.0685 5709	.0469 7130	.0318 4115	.0213 8213
2.40	.1190 9253	.0846 1407	.0594 0745	.0412 7577	.0284 1320
2.45	.1418 1203	.1031 0664	.0740 9775	.0527 0636	.0371 5008
2.50	.1670 0115	.1241 1453	.0911 9688	.0663 3834	.0478 2546

W_1	$P(W_1, .24)$	$P(W_1, .26)$	$P(W_1, .28)$	$P(W_1, .30)$	$P(W_1, .32)$
2.55	.1945 8840	.1476 6579	.1108 1820	.0823 4956	.0606 5913
2.60	.2244 4592	.1737 3200	.1330 2554	.1008 8001	.0758 4695
2.65	.2563 9142	.2022 2580	.1578 2668	.1220 2230	.0935 4979
2.70	.2901 9235	.2330 0094	.1851 6917	.1458 1388	.1138 8313
2.75	.3255 7232	.2658 5495	.2149 3867	.1722 3129	.1369 0809
2.80	.3622 1908	.3005 3419	.2469 6012	.2011 8709	.1626 2448
2.85	.3997 9391	.3367 4104	.2810 0152	.2325 2965	.1909 6652
2.90	.4379 4176	.3741 4295	.3167 8027	.2660 4585	.2218 0144
2.95	.4763 0167	.4123 8261	.3539 7170	.3014 6653	.2549 3124
3.00	.5145 1702	.4510 8894	.3922 1918	.3384 7457	.2900 9748
3.05	.5522 4503	.4898 8811	.4311 4537	.3767 1477	.3269 8879
3.10	.5891 6534	.5284 1429	.4703 6390	.4158 0537	.3652 5076
3.15	.6249 8706	.5663 1942	.5094 9105	.4553 5023	.4044 9756
3.20	.6594 5445	.6032 8182	.5481 5656	.4949 5114	.4443 2453
3.25	.6923 5086	.6390 1319	.5860 1352	.5342 1976	.4843 2123
3.30	.7235 0099	.6732 6390	.6227 4659	.5727 8837	.5240 8405
3.35	.7527 7170	.7058 2655	.6580 7847	.6103 1925	.5632 2798
3.40	.7800 7123	.7365 3769	.6917 7460	.6465 1219	.6013 9683
3.45	.8053 4730	.7652 7798	.7236 4577	.6811 1008	.6382 7166
3.50	.8285 8416	.7919 7079	.7535 4902	.7139 0242	.6735 7712
3.55	.8497 9884	.8165 7965	.7813 8688	.7447 2680	.7070 8566
3.60	.8690 3694	.8391 0473	.8071 0511	.7734 6867	.7386 1956
3.65	.8863 6807	.8595 7852	.8306 8937	.8000 5933	.7680 5102
3.70	.9018 8125	.8780 6122	.8521 6094	.8244 7280	.7953 0045
3.75	.9156 8037	.8946 3579	.8715 7194	.8467 2152	.8203 3329
3.80	.9278 7993	.9094 0307	.8890 0017	.8668 5139	.8431 5580
3.85	.9386 0108	.9224 7713	.9045 4393	.8849 3650	.8638 0991
3.90	.9479 6817	.9339 8084	.9183 1698	.9010 7357	.8823 6768
3.95	.9561 0569	.9440 4203	.9304 4378	.9153 7665	.8989 2556
4.00	.9631 3575	.9527 8997	.9410 5517	.9279 7196	.9135 9872
4.05	.9691 7611	.9603 5252	.9502 8461	.9389 9334	.9265 1568
4.10	.9743 3852	.9668 5373	.9582 6488	.9485 7805	.9378 1337
4.15	.9787 2768	.9724 1200	.9651 2548	.9568 6328	.9476 3272
4.20	.9824 4044	.9771 3872	.9709 9046	.9639 8325	.9561 1496
4.25	.9855 6541	.9811 3729	.9759 7688	.9700 6685	.9633 9845
4.30	.9881 8284	.9845 0260	.9801 9367	.9752 3591	.9696 1620
4.35	.9903 6471	.9873 2079	.9837 4100	.9796 0398	.9748 9402
4.40	.9921 7498	.9896 6926	.9867 0992	.9832 7552	.9793 4919
4.45	.9936 7007	.9916 1694	.9891 8231	.9863 4555	.9830 8959
4.50	.9948 9931	.9932 2464	.9912 3115	.9888 9956	.9862 1331
4.55	.9959 0551	.9945 4561	.9929 2089	.9910 1372	.9888 0857
4.60	.9967 2558	.9956 2610	.9943 0793	.9927 5527	.9909 5389
4.65	.9973 9112	.9965 0598	.9954 4128	.9941 8306	.9927 1854
4.70	.9979 2899	.9972 1940	.9963 6317	.9953 4815	.9941 6306
4.75	.9983 6191	.9977 9539	.9971 0975	.9962 9455	.9953 3996
4.80	.9987 0895	.9982 5849	.9977 1175	.9970 5986	.9962 9438
4.85	.9989 8604	.9986 2929	.9981 9510	.9976 7603	.9970 6489
4.90	.9992 0643	.9989 2499	.9985 8159	.9981 6999	.9976 8417
4.95	.9993 8105	.9991 5988	.9988 8935	.9985 6431	.9981 7973
5.00	.9995 1888	.9993 4573	.9991 3343	.9988 7778	.9985 7461

W_1	$P(W_1, .24)$	$P(W_1, .26)$	$P(W_1, .28)$	$P(W_1, .30)$	$P(W_1, .32)$
5.05	.9996 2727	.9994 9221	.9993 2626	.9991 2598	.9988 8795
5.10	.9997 1220	.9996 0724	.9994 7800	.9993 2170	.9991 3557
5.15	.9997 7850	.9996 9723	.9995 9696	.9994 7544	.9993 3046
5.20	.9998 3008	.9997 6737	.9996 8986	.9995 9574	.9994 8324
5.25	.9998 7007	.9998 2185	.9997 6214	.9996 8952	.9996 0256
5.30	.9999 0096	.9998 6401	.9998 1818	.9997 6235	.9996 9537
5.35	.9999 2474	.9998 9653	.9998 6147	.9998 1870	.9997 6731
5.40	.9999 4299	.9999 2152	.9998 9480	.9998 6214	.9998 2285
5.45	.9999 5695	.9999 4066	.9999 2036	.9998 9552	.9998 6558
5.50	.9999 6759	.9999 5527	.9999 3990	.9999 2107	.9998 9834
5.55	.9999 7567	.9999 6639	.9999 5479	.9999 4056	.9999 2337
5.60	.9999 8179	.9999 7482	.9999 6610	.9999 5538	.9999 4241
5.65	.9999 8641	.9999 8119	.9999 7465	.9999 6661	.9999 5687
5.70	.9999 8989	.9999 8599	.9999 8111	.9999 7509	.9999 6779
5.75	.9999 9250	.9999 8960	.9999 8596	.9999 8147	.9999 7602
5.80	.9999 9445	.9999 9230	.9999 8960	.9999 8626	.9999 8221
5.85	.9999 9591	.9999 9432	.9999 9232	.9999 8984	.9999 8683
5.90	.9999 9699	.9999 9582	.9999 9434	.9999 9251	.9999 9029
5.95	.9999 9779	.9999 9693	.9999 9584	.9999 9450	.9999 9286
6.00	.9999 9839	.9999 9775	.9999 9696	.9999 9597	.9999 9476
6.05	.9999 9882	.9999 9836	.9999 9778	.9999 9705	.9999 9617
6.10	.9999 9914	.9999 9881	.9999 9838	.9999 9785	.9999 9721
6.15	.9999 9938	.9999 9913	.9999 9882	.9999 9844	.9999 9797
6.20	.9999 9955	.9999 9937	.9999 9915	.9999 9887	.9999 9853
6.25	.9999 9968	.9999 9955	.9999 9939	.9999 9918	.9999 9894
6.30	.9999 9977	.9999 9967	.9999 9956	.9999 9941	.9999 9923
6.35	.9999 9983	.9999 9977	.9999 9968	.9999 9958	.9999 9945
6.40	.9999 9988	.9999 9983	.9999 9977	.9999 9970	.9999 9961
6.45	.9999 9991	.9999 9988	.9999 9984	.9999 9978	.9999 9972
6.50	.9999 9994	.9999 9991	.9999 9988	.9999 9985	.9999 9980
6.55	.9999 9996	.9999 9994	.9999 9992	.9999 9989	.9999 9986
6.60	.9999 9997	.9999 9996	.9999 9994	.9999 9992	.9999 9990
6.65	.9999 9998	.9999 9997	.9999 9996	.9999 9995	.9999 9993
6.70	.9999 9998	.9999 9998	.9999 9997	.9999 9996	.9999 9995
6.75	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9996
6.80	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9998
6.85	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9998
6.90	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9999
6.95		1.0000 0000	1.0000 0000	.9999 9999	.9999 9999
7.00				1.0000 0000	.9999 9999
7.05					1.0000 0000
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_1	$P(W_1, .34)$	$P(W_1, .36)$	$P(W_1, .38)$	$P(W_1, .40)$	$P(W_1, .50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15	.0000 0000				
1.20	.0000 0001	.0000 0000			
1.25	.0000 0002	.0000 0001			
1.30	.0000 0007	.0000 0002	.0000 0000		
1.35	.0000 0017	.0000 0005	.0000 0001	.0000 0000	
1.40	.0000 0041	.0000 0013	.0000 0004	.0000 0001	
1.45	.0000 0096	.0000 0031	.0000 0010	.0000 0003	
1.50	.0000 0213	.0000 0073	.0000 0025	.0000 0009	
1.55	.0000 0455	.0000 0166	.0000 0060	.0000 0021	
1.60	.0000 0937	.0000 0359	.0000 0136	.0000 0051	.0000 0000
1.65	.0000 1859	.0000 0747	.0000 0298	.0000 0118	.0000 0001
1.70	.0000 3564	.0000 1501	.0000 0628	.0000 0261	.0000 0003
1.75	.0000 6614	.0000 2913	.0000 1273	.0000 0553	.0000 0008
1.80	.0001 1900	.0000 5470	.0000 2496	.0000 1131	.0000 0020
1.85	.0002 0791	.0000 9955	.0000 4731	.0000 2233	.0000 0048
1.90	.0003 5320	.0001 7584	.0000 8690	.0000 4266	.0000 0112
1.95	.0005 8418	.0003 0190	.0001 5488	.0000 7893	.0000 0251
2.00	.0009 4184	.0005 0443	.0002 6821	.0001 4168	.0000 0538
2.05	.0014 8187	.0008 2126	.0004 5187	.0002 4702	.0000 1115
2.10	.0022 7776	.0013 0431	.0007 4156	.0004 1891	.0000 2228
2.15	.0034 2381	.0020 2288	.0011 8674	.0006 9177	.0000 4308
2.20	.0050 3762	.0030 6680	.0018 5395	.0011 1368	.0000 8065
2.25	.0072 6183	.0045 4924	.0028 3019	.0017 4972	.0001 4641
2.30	.0102 6461	.0066 0880	.0042 2592	.0026 8548	.0002 5802
2.35	.0142 3853	.0094 1043	.0061 7742	.0040 3030	.0004 4200
2.40	.0193 9769	.0131 4480	.0088 4807	.0059 1979	.0007 3683
2.45	.0259 7270	.0180 2582	.0124 2802	.0085 1736	.0011 9658
2.50	.0342 0370	.0242 8601	.0171 3205	.0120 1416	.0018 9499

W_1	$P(W_1, .34)$	$P(W_1, .36)$	$P(W_1, .38)$	$P(W_1, .40)$	$P(W_1, .50)$
2.55	.0443 3145	.0321 6979	.0231 9518	.0166 2701	.0029 2942
2.60	.0565 8700	.0419 2466	.0308 6605	.0225 9425	.0044 2467
2.65	.0711 8028	.0537 9074	.0403 9815	.0301 6904	.0065 3574
2.70	.0882 8850	.0679 8907	.0520 3917	.0396 1049	.0094 4936
2.75	.1080 4496	.0847 0955	.0660 1901	.0511 7279	.0133 8339
2.80	.1305 2916	.1040 9901	.0825 3718	.0650 9282	.0185 8389
2.85	.1557 5882	.1262 5062	.1017 5038	.0815 7712	.0253 1933
2.90	.1836 8462	.1511 9508	.1237 6120	.1007 8892	.0338 7195
2.95	.2141 8787	.1788 9451	.1486 0867	.1228 3632	.0445 2640
3.00	.2470 8149	.2092 3948	.1762 6161	.1477 6237	.0575 5621
3.05	.2821 1423	.2420 4940	.2066 1509	.1755 3793	.0732 0873
3.10	.3189 7793	.2770 7639	.2394 9053	.2060 5797	.0916 8974
3.15	.3573 1730	.3140 1237	.2746 3942	.2391 4146	.1131 4865
3.20	.3967 4175	.3524 9894	.3117 5038	.2745 3521	.1376 6563
3.25	.4368 3845	.3921 3945	.3504 5936	.3119 2117	.1652 4167
3.30	.4771 8589	.4325 1252	.3903 6199	.3509 2692	.1957 9247
3.35	.5173 6730	.4731 8621	.4310 2765	.3911 3861	.2291 4673
3.40	.5569 8309	.5137 3202	.4720 1419	.4321 1555	.2650 4911
3.45	.5956 6191	.5537 3805	.5128 8251	.4734 0545	.3031 6766
3.50	.6330 6980	.5928 2067	.5532 1035	.5145 5965	.3431 0522
3.55	.6689 1715	.6306 3426	.5926 0441	.5551 4734	.3844 1412
3.60	.7029 6343	.6668 7865	.6307 1058	.5947 6807	.4266 1299
3.65	.7350 1961	.7013 0421	.6672 2163	.6330 6225	.4692 0473
3.70	.7649 4850	.7337 1448	.7018 8255	.6697 1904	.5116 9446
3.75	.7926 6314	.7639 6665	.7344 9324	.7044 8164	.5536 0632
3.80	.8181 2366	.7919 6994	.7649 0894	.7371 4997	.5944 9847
3.85	.8413 3292	.8176 8238	.7930 3849	.7675 8085	.6339 7534
3.90	.8623 3121	.8411 0624	.8188 4095	.7956 8610	.6716 9695
3.95	.8811 9049	.8622 8258	.8423 2078	.8214 2882	.7073 8494
4.00	.8980 0835	.8812 8515	.8635 2209	.8448 1825	.7408 2551
4.05	.9129 0212	.8982 1420	.8825 2234	.8659 0377	.7718 6930
4.10	.9260 0320	.9131 9025	.8994 2586	.8847 6829	.8004 2885
4.15	.9374 5189	.9263 4826	.9143 5736	.9015 2147	.8264 7386
4.20	.9473 9278	.9378 3218	.9274 5595	.9162 9317	.8500 2495
4.25	.9559 7080	.9477 9024	.9388 6953	.9292 2711	.8711 4640
4.30	.9633 2799	.9563 7086	.9487 4993	.9404 7534	.8899 3830
4.35	.9696 0085	.9637 1925	.9572 4875	.9501 9319	.9065 2870
4.40	.9749 1840	.9699 7480	.9645 1396	.9585 3512	.9210 6595
4.45	.9794 0083	.9752 6903	.9706 8719	.9656 5132	.9337 1170
4.50	.9831 5859	.9797 2426	.9759 0178	.9716 8509	.9446 3453
4.55	.9862 9200	.9834 5270	.9802 8139	.9767 7083	.9540 0466
4.60	.9888 9115	.9865 5606	.9839 3922	.9810 3284	.9619 8938
4.65	.9910 3614	.9891 2552	.9869 7759	.9845 8449	.9687 4962
4.70	.9927 9750	.9912 4200	.9894 8802	.9875 2800	.9744 3723
4.75	.9942 3680	.9929 7658	.9915 5150	.9899 5449	.9791 9322
4.80	.9954 0733	.9943 9120	.9932 3902	.9919 4435	.9831 4659
4.85	.9963 5483	.9955 3933	.9946 1226	.9935 6787	.9864 1381
4.90	.9971 1830	.9964 6680	.9957 2435	.9948 8592	.9890 9879
4.95	.9977 3073	.9972 1257	.9966 2071	.9959 5079	.9912 9322
5.00	.9982 1986	.9978 0955	.9973 3985	.9968 0703	.9930 7715

W_1	$P(W_1, .34)$	$P(W_1, .36)$	$P(W_1, .38)$	$P(W_1, .40)$	$P(W_1, .50)$
5.05	.9986 0883	.9982 8532	.9979 1419	.9974 9233	.9945 1984
5.10	.9989 1685	.9986 6284	.9983 7087	.9980 3833	.9956 8065
5.15	.9991 5976	.9989 6114	.9987 3241	.9984 7141	.9966 1003
5.20	.9993 5055	.9991 9587	.9990 1742	.9988 1344	.9973 5052
5.25	.9994 9980	.9993 7982	.9992 4117	.9990 8240	.9979 3775
5.30	.9996 1611	.9995 2340	.9994 1609	.9992 9303	.9984 0127
5.35	.9997 0639	.9996 3503	.9995 5231	.9994 5729	.9987 6551
5.40	.9997 7621	.9997 2149	.9996 5796	.9995 8489	.9990 5046
5.45	.9998 3000	.9997 8819	.9997 3959	.9996 8361	.9992 7243
5.50	.9998 7129	.9998 3947	.9998 0242	.9997 5970	.9994 4461
5.55	.9999 0287	.9998 7874	.9998 5060	.9998 1812	.9995 7760
5.60	.9999 2694	.9999 0870	.9998 8741	.9998 6280	.9996 7992
5.65	.9999 4523	.9999 3149	.9999 1543	.9998 9685	.9997 5832
5.70	.9999 5906	.9999 4875	.9999 3669	.9999 2271	.9998 1816
5.75	.9999 6950	.9999 6178	.9999 5275	.9999 4228	.9998 6366
5.80	.9999 7735	.9999 7159	.9999 6485	.9999 5703	.9998 9813
5.85	.9999 8323	.9999 7895	.9999 7394	.9999 6811	.9999 2414
5.90	.9999 8762	.9999 8445	.9999 8073	.9999 7641	.9999 4370
5.95	.9999 9089	.9999 8855	.9999 8580	.9999 8261	.9999 5835
6.00	.9999 9331	.9999 9159	.9999 8957	.9999 8721	.9999 6929
6.05	.9999 9511	.9999 9385	.9999 9236	.9999 9063	.9999 7743
6.10	.9999 9643	.9999 9551	.9999 9442	.9999 9315	.9999 8346
6.15	.9999 9740	.9999 9673	.9999 9594	.9999 9501	.9999 8792
6.20	.9999 9812	.9999 9763	.9999 9705	.9999 9638	.9999 9121
6.25	.9999 9864	.9999 9828	.9999 9787	.9999 9738	.9999 9362
6.30	.9999 9902	.9999 9876	.9999 9846	.9999 9811	.9999 9538
6.35	.9999 9929	.9999 9911	.9999 9889	.9999 9864	.9999 9667
6.40	.9999 9949	.9999 9936	.9999 9920	.9999 9902	.9999 9760
6.45	.9999 9964	.9999 9954	.9999 9943	.9999 9930	.9999 9828
6.50	.9999 9974	.9999 9967	.9999 9959	.9999 9950	.9999 9877
6.55	.9999 9982	.9999 9977	.9999 9971	.9999 9964	.9999 9912
6.60	.9999 9987	.9999 9984	.9999 9979	.9999 9975	.9999 9938
6.65	.9999 9991	.9999 9988	.9999 9985	.9999 9982	.9999 9956
6.70	.9999 9994	.9999 9992	.9999 9990	.9999 9987	.9999 9969
6.75	.9999 9995	.9999 9994	.9999 9993	.9999 9991	.9999 9978
6.80	.9999 9997	.9999 9996	.9999 9995	.9999 9994	.9999 9985
6.85	.9999 9998	.9999 9997	.9999 9996	.9999 9996	.9999 9989
6.90	.9999 9998	.9999 9998	.9999 9998	.9999 9997	.9999 9992
6.95	.9999 9999	.9999 9999	.9999 9998	.9999 9998	.9999 9995
7.00	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9996
7.05	.9999 9999	.9999 9999	.9999 9999	.9999 9999	.9999 9997
7.10	1.0000 0000	1.0000 0000	.9999 9999	.9999 9999	.9999 9998
7.15			1.0000 0000	1.0000 0000	.9999 9999
7.20					.9999 9999
7.25					.9999 9999
7.30					1.0000 0000
7.35					
7.40					
7.45					
7.50					

W_1	$P(W_1, 60)$	$P(W_1, 70)$	$P(W_1, 80)$	$P(W_1, 90)$	$P(W_1, 100)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20					
1.25					
1.30					
1.35					
1.40					
1.45					
1.50					
1.55					
1.60					
1.65					
1.70					
1.75					
1.80	.0000 0000				
1.85	.0000 0001				
1.90	.0000 0003				
1.95	.0000 0007	.0000 0000			
2.00	.0000 0019	.0000 0001			
2.05	.0000 0046	.0000 0002			
2.10	.0000 0108	.0000 0005	.0000 0000		
2.15	.0000 0244	.0000 0013	.0000 0001		
2.20	.0000 0531	.0000 0033	.0000 0002		
2.25	.0000 1114	.0000 0079	.0000 0005	.0000 0000	
2.30	.0000 2256	.0000 0185	.0000 0014	.0000 0001	
2.35	.0000 4415	.0000 0413	.0000 0037	.0000 0003	.0000 0000
2.40	.0000 8359	.0000 0888	.0000 0090	.0000 0009	.0000 0001
2.45	.0001 5334	.0000 1842	.0000 0211	.0000 0023	.0000 0002
2.50	.0002 7289	.0000 3685	.0000 0474	.0000 0059	.0000 0007

W_1	$P(W_1, .60)$	$P(W_1, .70)$	$P(W_1, .80)$	$P(W_1, .90)$	$P(W_1, .100)$
2.55	.0004 7165	.0000 7124	.0000 1026	.0000 0142	.0000 0019
2.60	.0007 9262	.0001 3328	.0000 2138	.0000 0331	.0000 0050
2.65	.0012 9654	.0002 4158	.0000 4295	.0000 0736	.0000 0123
2.70	.0020 6650	.0004 2473	.0000 8333	.0000 1577	.0000 0290
2.75	.0032 1249	.0007 2519	.0001 5634	.0000 3252	.0000 0657
2.80	.0048 7558	.0012 0380	.0002 8397	.0000 6465	.0000 1431
2.85	.0072 3084	.0019 4484	.0005 0000	.0001 2410	.0000 2995
2.90	.0104 8861	.0030 6123	.0008 5442	.0002 3031	.0000 6037
2.95	.0148 9324	.0046 9917	.0014 1865	.0004 1375	.0001 1737
3.00	.0207 1880	.0070 4172	.0022 9115	.0007 2043	.0002 2039
3.05	.0282 6161	.0103 1039	.0036 0302	.0012 1726	.0004 0021
3.10	.0378 2924	.0147 6401	.0055 2281	.0019 9811	.0007 0370
3.15	.0497 2661	.0206 9413	.0082 5974	.0031 8991	.0011 9958
3.20	.0642 3981	.0284 1678	.0120 6439	.0049 5823	.0019 8485
3.25	.0816 1854	.0382 6029	.0172 2594	.0075 1139	.0031 9142
3.30	.1020 5872	.0505 4968	.0240 6552	.0111 0193	.0049 9212
3.35	.1256 8647	.0655 8850	.0329 2512	.0160 2471	.0076 0507
3.40	.1525 4497	.0836 3930	.0441 5239	.0226 1059	.0112 9526
3.45	.1825 8525	.1049 0419	.0580 8201	.0312 1543	.0163 7233
3.50	.2156 6200	.1295 0729	.0750 1475	.0422 0439	.0231 8356
3.55	.2515 3471	.1574 8055	.0951 9588	.0559 3231	.0321 0173
3.60	.2898 7412	.1887 5434	.1187 9473	.0727 2122	.0435 0786
3.65	.3302 7377	.2231 5373	.1458 8734	.0928 3696	.0577 6976
3.70	.3722 6554	.2604 0103	.1764 4379	.1164 6672	.0752 1768
3.75	.4153 3821	.3001 2429	.2103 2158	.1436 9981	.0961 1921
3.80	.4589 5768	.3418 7135	.2472 6588	.1745 1344	.1206 5546
3.85	.5025 8754	.3851 2822	.2869 1653	.2087 6505	.1489 0118
3.90	.5457 0857	.4293 4043	.3288 2156	.2461 9217	.1808 1052
3.95	.5878 3628	.4739 3584	.3724 5596	.2864 1983	.2162 1034
4.00	.6285 3543	.5183 4725	.4172 4434	.3289 7501	.2548 0162
4.05	.6674 3108	.5620 3348	.4625 8558	.3733 0700	.2961 6913
4.10	.7042 1595	.6044 9766	.5078 7787	.4188 1195	.3397 9853
4.15	.7386 5399	.6453 0188	.5525 4225	.4648 5961	.3850 9949
4.20	.7705 8055	.6840 7775	.5960 4344	.5108 2036	.4314 3279
4.25	.7998 9950	.7205 3265	.6379 0671	.5560 9054	.4781 3930
4.30	.8265 7794	.7544 5187	.6777 3025	.6001 1462	.5245 6862
4.35	.8506 3908	.7856 9712	.7151 9282	.6424 0303	.5701 0531
4.40	.8721 5399	.8142 0179	.7500 5667	.6825 4492	.6141 9129
4.45	.8912 3271	.8399 6404	.7821 6640	.7202 1574	.6563 4318
4.50	.9080 1531	.8630 3799	.8114 4419	.7551 7978	.6961 6409
4.55	.9226 6336	.8835 2421	.8378 8236	.7872 8820	.7333 4970
4.60	.9353 5203	.9015 5971	.8615 3400	.8164 7337	.7676 8913
4.65	.9462 6317	.9173 0828	.8825 0247	.8427 4033	.7990 6122
4.70	.9555 7936	.9309 5151	.9009 3064	.8661 5639	.8274 2712
4.75	.9634 7913	.9426 8064	.9169 9028	.8868 3971	.8528 2024
4.80	.9701 3321	.9526 8973	.9308 7223	.9049 4768	.8753 3457
4.85	.9757 0181	.9611 6990	.9427 7765	.9206 6562	.8951 1229
4.90	.9803 3274	.9683 0489	.9529 1050	.9341 9654	.9123 3141
4.95	.9841 6041	.9742 6775	.9614 7138	.9457 5200	.9271 9428
5.00	.9873 0542	.9792 1858	.9686 5279	.9555 4450	.9399 1706

W_1	$P(W_1, .60)$	$P(W_1, .70)$	$P(W_1, .80)$	$P(W_1, .90)$	$P(W_1, .100)$
5.05	.9898 7462	.9833 0317	.9746 3558	.9637 8130	.9507 2084
5.10	.9919 6169	.9866 5242	.9795 8662	.9706 5975	.9598 2428
5.15	.9936 4786	.9893 8236	.9836 5738	.9763 6390	.9674 3779
5.20	.9950 0291	.9915 9464	.9869 8343	.9810 6240	.9737 5935
5.25	.9960 8623	.9933 7735	.9896 8453	.9849 0732	.9789 7166
5.30	.9969 4795	.9948 0605	.9918 6518	.9880 3388	.9832 4040
5.35	.9976 3003	.9959 4495	.9936 1559	.9905 6074	.9867 1361
5.40	.9981 6734	.9968 4813	.9950 1285	.9925 9080	.9895 2170
5.45	.9985 8861	.9975 6078	.9961 2218	.9942 1235	.9917 7818
5.50	.9989 1740	.9981 2032	.9969 9829	.9955 0037	.9935 8065
5.55	.9991 7287	.9985 5754	.9976 8667	.9965 1789	.9950 1219
5.60	.9993 7049	.9988 9759	.9982 2486	.9973 1748	.9961 4280
5.65	.9995 2272	.9991 6086	.9986 4359	.9979 4260	.9970 3090
5.70	.9996 3949	.9993 6377	.9989 6783	.9984 2887	.9977 2483
5.75	.9997 2869	.9995 1948	.9992 1775	.9988 0529	.9982 6428
5.80	.9997 9656	.9996 3846	.9994 0951	.9990 9530	.9986 8154
5.85	.9998 4800	.9997 2900	.9995 5601	.9993 1770	.9990 0273
5.90	.9998 8682	.9997 9761	.9996 6744	.9994 8747	.9992 4880
5.95	.9999 1603	.9998 4939	.9997 5184	.9996 1651	.9994 3645
6.00	.9999 3790	.9998 8833	.9998 1551	.9997 1417	.9995 7891
6.05	.9999 5424	.9999 1749	.9998 6334	.9997 8776	.9996 8659
6.10	.9999 6639	.9999 3924	.9998 9913	.9998 4299	.9997 6762
6.15	.9999 7539	.9999 5541	.9999 2581	.9998 8427	.9998 2835
6.20	.9999 8204	.9999 6739	.9999 4562	.9999 1500	.9998 7368
6.25	.9999 8694	.9999 7623	.9999 6028	.9999 3779	.9999 0738
6.30	.9999 9053	.9999 8273	.9999 7109	.9999 5463	.9999 3233
6.35	.9999 9315	.9999 8749	.9999 7902	.9999 6702	.9999 5073
6.40	.9999 9506	.9999 9097	.9999 8483	.9999 7611	.9999 6425
6.45	.9999 9645	.9999 9350	.9999 8906	.9999 8275	.9999 7415
6.50	.9999 9746	.9999 9534	.9999 9214	.9999 8759	.9999 8137
6.55	.9999 9819	.9999 9666	.9999 9437	.9999 9110	.9999 8662
6.60	.9999 9871	.9999 9762	.9999 9598	.9999 9364	.9999 9042
6.65	.9999 9908	.9999 9831	.9999 9714	.9999 9546	.9999 9317
6.70	.9999 9935	.9999 9880	.9999 9797	.9999 9678	.9999 9514
6.75	.9999 9954	.9999 9915	.9999 9856	.9999 9772	.9999 9655
6.80	.9999 9968	.9999 9940	.9999 9899	.9999 9839	.9999 9756
6.85	.9999 9977	.9999 9958	.9999 9929	.9999 9886	.9999 9828
6.90	.9999 9984	.9999 9971	.9999 9950	.9999 9920	.9999 9879
6.95	.9999 9989	.9999 9979	.9999 9965	.9999 9944	.9999 9915
7.00	.9999 9992	.9999 9986	.9999 9976	.9999 9961	.9999 9941
7.05	.9999 9995	.9999 9990	.9999 9983	.9999 9973	.9999 9959
7.10	.9999 9996	.9999 9993	.9999 9988	.9999 9981	.9999 9971
7.15	.9999 9997	.9999 9995	.9999 9992	.9999 9987	.9999 9980
7.20	.9999 9998	.9999 9997	.9999 9994	.9999 9991	.9999 9986
7.25	.9999 9999	.9999 9998	.9999 9996	.9999 9994	.9999 9991
7.30	.9999 9999	.9999 9998	.9999 9997	.9999 9996	.9999 9994
7.35	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9996
7.40	1.0000 0000	.9999 9999	.9999 9999	.9999 9998	.9999 9997
7.45		1.0000 0000	.9999 9999	.9999 9999	.9999 9998
7.50			.9999 9999	.9999 9999	.9999 9999

W_1	$P(W_1,60)$	$P(W_1,70)$	$P(W_1,80)$	$P(W_1,90)$	$P(W_1,100)$
7.55			1.0000 0000	.9999 9999	.9999 9999
7.60				1.0000 0000	.9999 9999
7.65					1.0000 0000
7.70					
7.75					
7.80					
7.85					
7.90					
7.95					
8.00					
8.05					
8.10					
8.15					
8.20					
8.25					
8.30					
8.35					
8.40					
8.45					
8.50					
8.55					
8.60					
8.65					
8.70					
8.75					
8.80					
8.85					
8.90					
8.95					
9.00					
9.05					
9.10					
9.15					
9.20					
9.25					
9.30					
9.35					
9.40					
9.45					
9.50					
9.55					
9.60					
9.65					
9.70					
9.75					
9.80					
9.85					
9.90					
9.95					
10.00					

W_2	$P(W_2,2)$	$P(W_2,3)$	$P(W_2,4)$	$P(W_2,5)$	$P(W_2,6)$
0.05					.1012 5824
0.10					.1942 6594
0.15					.2794 5475
0.20					.3572 6116
0.25					.4281 2284
0.30					.4924 7528
0.35					.5507 4869
0.40					.6033 6518
0.45					.6507 3633
0.50					.6932 6101
0.55					.7313 2354
0.60					.7652 9221
0.65					.7955 1806
0.70					.8223 3395
0.75					.8460 5393
0.80					.8669 7290
0.85					.8853 6641
0.90					.9014 9078
0.95					.9155 8332
1.00					.9278 6281
1.05					.9385 3001
1.10					.9477 6838
1.15					.9557 4484
1.20					.9626 1063
1.25					.9685 0222
1.30					.9735 4223
1.35					.9778 4038
1.40					.9814 9449
1.45					.9845 9138
1.50					.9872 0781
1.55					.9894 1138
1.60					.9912 6142
1.65					.9928 0974
1.70					.9941 0145
1.75					.9951 7566
1.80					.9960 6615
1.85					.9968 0200
1.90					.9974 0811
1.95					.9979 0575
2.00					.9983 1303
2.05					.9986 4529
2.10					.9989 1546
2.15					.9991 3443
2.20					.9993 1134
2.25					.9994 5380
2.30					.9995 6814
2.35					.9996 5961
2.40					.9997 3256
2.45					.9997 9053
2.50					.9998 3645

W_2	$P(W_2, 2)$	$P(W_2, 3)$	$P(W_2, 4)$	$P(W_2, 5)$	$P(W_2, 6)$
2.55					.9998 7272
2.60					.9999 0125
2.65					.9999 2363
2.70					.9999 4113
2.75					.9999 5477
2.80					.9999 6535
2.85					.9999 7355
2.90					.9999 7987
2.95					.9999 8473
3.00					.9999 8846
3.05					.9999 9130
3.10					.9999 9346
3.15					.9999 9511
3.20					.9999 9635
3.25					.9999 9728
3.30					.9999 9799
3.35					.9999 9851
3.40					.9999 9890
3.45					.9999 9920
3.50					.9999 9941
3.55					.9999 9957
3.60					.9999 9969
3.65					.9999 9977
3.70					.9999 9984
3.75					.9999 9988
3.80					.9999 9992
3.85					.9999 9994
3.90					.9999 9996
3.95					.9999 9997
4.00					.9999 9998
4.05					.9999 9998
4.10					.9999 9999
4.15					.9999 9999
4.20					.9999 9999
4.25					1.0000 0000
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_2	$P(W_2, 7)$	$P(W_2, 8)$	$P(W_2, 9)$	$P(W_2, 10)$	$P(W_2, 11)$
0.05	.0063 0731	.0003 0655	.0000 1276	.0000 0048	.0000 0002
0.10	.0238 5216	.0023 0145	.0001 9070	.0000 1421	.0000 0098
0.15	.0506 8641	.0072 7782	.0009 0007	.0001 0027	.0000 1034
0.20	.0850 2217	.0161 3903	.0026 4696	.0003 9166	.0000 5367
0.25	.1252 3408	.0294 4578	.0060 0153	.0011 0538	.0001 8874
0.30	.1698 5919	.0474 6346	.0115 3552	.0025 3792	.0005 1814
0.35	.2175 9467	.0702 0904	.0197 7287	.0050 5007	.0011 9815
0.40	.2672 9356	.0974 9628	.0311 5295	.0090 4451	.0024 4194
0.45	.3179 5881	.1289 7854	.0460 0547	.0149 3953	.0045 1679
0.50	.3687 3597	.1641 8855	.0645 3604	.0231 4168	.0077 3535
0.55	.4189 0466	.2025 7465	.0868 2098	.0340 1986	.0124 4185
0.60	.4678 6923	.2435 3301	.1128 0983	.0478 8252	.0189 9460
0.65	.5151 4872	.2864 3582	.1423 3425	.0649 5949	.0277 4622
0.70	.5603 6651	.3306 5528	.1751 2157	.0853 8903	.0390 2336
0.75	.6032 3977	.3755 8335	.2108 1171	.1092 1065	.0531 0737
0.80	.6435 6888	.4206 4757	.2489 7612	.1363 6337	.0702 1732
0.85	.6812 2721	.4653 2307	.2891 3743	.1666 8922	.0904 9651
0.90	.7161 5110	.5091 4111	.3307 8901	.1999 4117	.1140 0305
0.95	.7483 3043	.5516 9448	.3734 1341	.2357 9464	.1407 0515
1.00	.7777 9972	.5926 4015	.4164 9914	.2738 6175	.1704 8098
1.05	.8046 2992	.6316 9958	.4595 5527	.3137 0715	.2031 2292
1.10	.8289 2088	.6686 5704	.5021 2364	.3548 6468	.2383 4570
1.15	.8507 9458	.7033 5644	.5437 8842	.3968 5383	.2757 9771
1.20	.8703 8910	.7356 9687	.5841 8312	.4391 9544	.3150 7469
1.25	.8878 5335	.7656 2736	.6229 9505	.4814 2577	.3557 3488
1.30	.9033 4250	.7931 4110	.6599 6757	.5231 0880	.3973 1478
1.35	.9170 1410	.8182 6932	.6949 0015	.5638 4625	.4393 4470
1.40	.9290 2490	.8410 7520	.7276 4685	.6032 8519	.4813 6337
1.45	.9395 2821	.8616 4788	.7581 1322	.6411 2336	.5229 3111
1.50	.9486 7183	.8800 9679	.7862 5216	.6771 1210	.5636 4098
1.55	.9565 9648	.8965 4642	.8120 5899	.7110 5723	.6031 2775
1.60	.9634 3470	.9111 3151	.8355 6599	.7428 1805	.6410 7448
1.65	.9693 1000	.9239 9285	.8568 3671	.7723 0476	.6772 1676
1.70	.9743 3653	.9352 7362	.8759 6026	.7994 7468	.7113 4465
1.75	.9786 1883	.9451 1630	.8930 4579	.8243 2745	.7433 0261
1.80	.9822 5192	.9536 6014	.9082 1726	.8468 9972	.7729 8760
1.85	.9853 2153	.9610 3912	.9216 0870	.8672 5946	.8003 4576
1.90	.9879 0447	.9673 8045	.9333 5990	.8855 0011	.8253 6791
1.95	.9900 6911	.9728 0341	.9436 1276	.9017 3506	.8480 8426
2.00	.9918 7590	.9774 1868	.9525 0810	.9160 9219	.8685 5862
2.05	.9933 7799	.9813 2788	.9601 8312	.9287 0906	.8868 8247
2.10	.9946 2182	.9846 2350	.9667 6934	.9397 2846	.9031 6900
2.15	.9956 4773	.9873 8898	.9723 9109	.9492 9466	.9175 4744
2.20	.9964 9059	.9896 9895	.9771 6442	.9575 5019	.9301 5784
2.25	.9971 8037	.9916 1969	.9811 9641	.9646 3323	.9411 4631
2.30	.9977 4268	.9932 0962	.9845 8482	.9706 7561	.9506 6095
2.35	.9981 9931	.9945 1986	.9874 1804	.9758 0125	.9588 4833
2.40	.9985 6869	.9955 9485	.9897 7527	.9801 2519	.9658 5068
2.45	.9988 6635	.9964 7298	.9917 2684	.9837 5295	.9718 0366
2.50	.9991 0531	.9971 8719	.9933 3473	.9867 8026	.9768 3473

W_2	$P(W_2,7)$	$P(W_2,8)$	$P(W_2,9)$	$P(W_2,10)$	$P(W_2,11)$
2.55	.9992 9641	.9977 6558	.9946 5309	.9892 9313	.9810 6201
2.60	.9994 4866	.9982 3197	.9957 2893	.9913 6807	.9845 9367
2.65	.9995 6949	.9986 0647	.9966 0273	.9930 7255	.9875 2757
2.70	.9996 6504	.9989 0590	.9973 0913	.9944 6558	.9899 5140
2.75	.9997 4030	.9991 4432	.9978 7756	.9955 9833	.9919 4288
2.80	.9997 9936	.9993 3337	.9983 3289	.9965 1484	.9935 7031
2.85	.9998 4554	.9994 8264	.9986 9595	.9972 5273	.9948 9317
2.90	.9998 8151	.9996 0003	.9989 8415	.9978 4392	.9959 6281
2.95	.9999 0943	.9996 9196	.9992 1191	.9983 1529	.9968 2320
3.00	.9999 3101	.9997 6367	.9993 9109	.9986 8933	.9975 1173
3.05	.9999 4764	.9998 1937	.9995 3145	.9989 8473	.9980 5993
3.10	.9999 6040	.9998 6247	.9996 4091	.9992 1693	.9984 9422
3.15	.9999 7015	.9998 9568	.9997 2591	.9993 9860	.9988 3655
3.20	.9999 7758	.9999 2117	.9997 9163	.9995 4008	.9991 0508
3.25	.9999 8322	.9999 4066	.9998 4222	.9996 4977	.9993 1469
3.30	.9999 8749	.9999 5549	.9998 8101	.9997 3441	.9994 7751
3.35	.9999 9070	.9999 6674	.9999 1061	.9997 9944	.9996 0340
3.40	.9999 9312	.9999 7525	.9999 3312	.9998 4918	.9997 0027
3.45	.9999 9492	.9999 8164	.9999 5015	.9998 8705	.9997 7446
3.50	.9999 9627	.9999 8644	.9999 6300	.9999 1576	.9998 3101
3.55	.9999 9726	.9999 9001	.9999 7264	.9999 3743	.9998 7393
3.60	.9999 9800	.9999 9268	.9999 7984	.9999 5371	.9999 0635
3.65	.9999 9855	.9999 9465	.9999 8521	.9999 6590	.9999 3072
3.70	.9999 9895	.9999 9610	.9999 8919	.9999 7498	.9999 4897
3.75	.9999 9924	.9999 9717	.9999 9213	.9999 8171	.9999 6256
3.80	.9999 9945	.9999 9796	.9999 9429	.9999 8669	.9999 7265
3.85	.9999 9961	.9999 9853	.9999 9588	.9999 9035	.9999 8011
3.90	.9999 9972	.9999 9895	.9999 9703	.9999 9303	.9999 8559
3.95	.9999 9980	.9999 9925	.9999 9787	.9999 9499	.9999 8960
4.00	.9999 9986	.9999 9946	.9999 9848	.9999 9641	.9999 9253
4.05	.9999 9990	.9999 9962	.9999 9892	.9999 9744	.9999 9465
4.10	.9999 9993	.9999 9973	.9999 9923	.9999 9818	.9999 9619
4.15	.9999 9995	.9999 9981	.9999 9946	.9999 9871	.9999 9729
4.20	.9999 9997	.9999 9987	.9999 9962	.9999 9909	.9999 9809
4.25	.9999 9998	.9999 9991	.9999 9973	.9999 9936	.9999 9865
4.30	.9999 9998	.9999 9994	.9999 9981	.9999 9955	.9999 9905
4.35	.9999 9999	.9999 9996	.9999 9987	.9999 9969	.9999 9934
4.40	.9999 9999	.9999 9997	.9999 9991	.9999 9978	.9999 9954
4.45	.9999 9999	.9999 9998	.9999 9994	.9999 9985	.9999 9968
4.50	1.0000 0000	.9999 9999	.9999 9996	.9999 9990	.9999 9978
4.55		.9999 9999	.9999 9997	.9999 9993	.9999 9985
4.60		.9999 9999	.9999 9998	.9999 9995	.9999 9990
4.65		1.0000 0000	.9999 9999	.9999 9997	.9999 9993
4.70			.9999 9999	.9999 9998	.9999 9995
4.75			.9999 9999	.9999 9998	.9999 9997
4.80			1.0000 0000	.9999 9999	.9999 9998
4.85				.9999 9999	.9999 9999
4.90				1.0000 0000	.9999 9999
4.95					.9999 9999
5.00					1.0000 0000

W_2	$P(W_2,12)$	$P(W_2,13)$	$P(W_2,14)$	$P(W_2,15)$	$P(W_2,16)$
0.05	.0000 0000				
0.10	.0000 0006	.0000 0000	.0000 0000		
0.15	.0000 0100	.0000 0009	.0000 0001	.0000 0000	
0.20	.0000 0693	.0000 0085	.0000 0010	.0000 0001	.0000 0000
0.25	.0000 3038	.0000 0467	.0000 0069	.0000 0010	.0000 0001
0.30	.0000 9979	.0000 1834	.0000 0324	.0000 0056	.0000 0009
0.35	.0002 6834	.0000 5738	.0000 1181	.0000 0235	.0000 0046
0.40	.0006 2281	.0001 5172	.0000 3559	.0000 0809	.0000 0179
0.45	.0012 9095	.0003 5260	.0000 9277	.0000 2365	.0000 0587
0.50	.0024 4615	.0007 3961	.0002 1549	.0000 6086	.0000 1674
0.55	.0043 0831	.0014 2717	.0004 5574	.0001 4111	.0000 4256
0.60	.0071 4037	.0025 6925	.0008 9154	.0003 0006	.0000 9839
0.65	.0112 4060	.0043 6145	.0016 3268	.0005 9298	.0002 0987
0.70	.0169 3080	.0070 3979	.0028 2530	.0011 0046	.0004 1779
0.75	.0245 4146	.0108 7587	.0046 5428	.0019 3372	.0007 8330
0.80	.0343 9477	.0161 6821	.0073 4294	.0032 3883	.0013 9320
0.85	.0467 8691	.0232 3038	.0111 4943	.0051 9904	.0023 6496
0.90	.0619 7071	.0323 7652	.0163 5970	.0080 3468	.0038 5055
0.95	.0801 4025	.0439 0514	.0232 7722	.0119 9990	.0060 3842
1.00	.1014 1809	.0580 8255	.0322 0989	.0173 7627	.0091 5309
1.05	.1258 4616	.0751 2691	.0434 5499	.0244 6305	.0134 5175
1.10	.1533 8085	.0951 9415	.0572 8314	.0335 6476	.0192 1760
1.15	.1838 9227	.1183 6672	.0739 2234	.0449 7659	.0267 5015
1.20	.2171 6785	.1446 4588	.0935 4339	.0589 6855	.0363 5264
1.25	.2529 1971	.1739 4809	.1162 4755	.0757 6967	.0483 1740
1.30	.2907 9531	.2061 0557	.1420 5748	.0955 5311	.0629 1007
1.35	.3303 9051	.2408 7100	.1709 1201	.1184 2345	.0803 5360
1.40	.3712 6444	.2779 2588	.2026 6502	.1444 0706	.1008 1344
1.45	.4129 5493	.3168 9199	.2370 8864	.1734 4619	.1243 8478
1.50	.4549 9414	.3573 4516	.2738 8029	.2053 9733	.1510 8300
1.55	.4969 2313	.3988 3051	.3126 7322	.2400 3378	.1808 3789
1.60	.5383 0525	.4408 7822	.3530 4970	.2770 5240	.2134 9227
1.65	.5787 3741	.4830 1910	.3945 5613	.3160 8389	.2488 0490
1.70	.6178 5927	.5247 9907	.4367 1906	.3567 0613	.2864 5769
1.75	.6553 5989	.5657 9209	.4790 6129	.3984 5940	.3260 6657
1.80	.6909 8202	.6056 1089	.5211 1722	.4408 6286	.3671 9536
1.85	.7245 2404	.6439 1540	.5624 4666	.4834 3115	.4093 7168
1.90	.7558 3973	.6804 1856	.6026 4666	.5256 9031	.4521 0395
1.95	.7848 3619	.7148 8969	.6413 6093	.5671 9216	.4948 9857
2.00	.8114 7026	.7471 5542	.6782 8657	.6075 2670	.5372 7614
2.05	.8357 4375	.7770 9850	.7131 7819	.6463 3191	.5787 8620
2.10	.8576 9778	.8046 5485	.7458 4953	.6833 0089	.6190 1963
2.15	.8774 0679	.8298 0910	.7761 7260	.7181 8614	.6576 1842
2.20	.8949 7221	.8525 8911	.8040 7503	.7508 0118	.6942 8254
2.25	.9105 1632	.8730 5980	.8295 3562	.7810 1973	.7287 7389
2.30	.9241 7641	.8913 1659	.8525 7880	.8087 7274	.7609 1739
2.35	.9360 9936	.9074 7892	.8732 6821	.8340 4377	.7905 9966
2.40	.9464 3685	.9216 8388	.8916 9991	.8568 6308	.8177 6548
2.45	.9553 4121	.9340 8034	.9079 9548	.8773 0087	.8424 1253
2.50	.9629 6202	.9448 2367	.9222 9536	.8954 6013	.8645 8502

W_2	$P(W_2 \cdot 12)$	$P(W_2 \cdot 13)$	$P(W_2 \cdot 14)$	$P(W_2 \cdot 15)$	$P(W_2 \cdot 16)$
2.55	.9694 4325	.9540 7116	.9347 5257	.9114 6940	.8843 6638
2.60	.9749 2124	.9619 7806	.9455 2714	.9254 7583	.9018 7178
2.65	.9795 2313	.9686 9452	.9547 8115	.9376 3864	.9172 4056
2.70	.9833 6591	.9743 6313	.9626 7465	.9481 2340	.9306 2904
2.75	.9865 5590	.9791 1717	.9693 6233	.9570 9692	.9422 0397
2.80	.9891 8864	.9830 7945	.9749 9090	.9647 2311	.9521 3670
2.85	.9913 4906	.9863 6166	.9796 9731	.9711 5962	.9605 9815
2.90	.9931 1190	.9890 6420	.9836 0751	.9765 5529	.9677 5479
2.95	.9945 4234	.9912 7626	.9868 3579	.9810 4838	.9737 6543
3.00	.9956 9670	.9930 7630	.9894 8461	.9847 6545	.9787 7887
3.05	.9966 2322	.9945 3265	.9916 4476	.9878 2080	.9829 3230
3.10	.9973 6290	.9957 0426	.9933 9583	.9903 1637	.9863 5043
3.15	.9979 5030	.9966 4153	.9948 0694	.9923 4207	.9891 4508
3.20	.9984 1434	.9973 8720	.9959 3746	.9939 7632	.9914 1535
3.25	.9987 7903	.9979 7721	.9968 3801	.9952 8683	.9932 4799
3.30	.9990 6420	.9984 4155	.9975 5131	.9963 3150	.9947 1819
3.35	.9992 8605	.9988 0505	.9981 1315	.9971 5940	.9958 9043
3.40	.9994 5779	.9990 8811	.9985 5326	.9978 1174	.9968 1947
3.45	.9995 9008	.9993 0740	.9988 9614	.9983 2282	.9975 5142
3.50	.9996 9148	.9994 7641	.9991 6184	.9987 2099	.9981 2472
3.55	.9997 6883	.9996 0601	.9993 6664	.9990 2949	.9985 7118
3.60	.9998 2756	.9997 0489	.9995 2369	.9992 6721	.9989 1690
3.65	.9998 7193	.9997 7997	.9996 4348	.9994 4940	.9991 8310
3.70	.9999 0530	.9998 3669	.9997 3439	.9995 8830	.9993 8695
3.75	.9999 3028	.9998 7933	.9998 0304	.9996 9363	.9995 4221
3.80	.9999 4889	.9999 1123	.9998 5462	.9997 7310	.9996 5982
3.85	.9999 6269	.9999 3499	.9998 9318	.9998 3274	.9997 4844
3.90	.9999 7288	.9999 5260	.9999 2187	.9998 7729	.9998 1487
3.95	.9999 8037	.9999 6559	.9999 4311	.9999 1038	.9998 6440
4.00	.9999 8586	.9999 7513	.9999 5876	.9999 3485	.9999 0115
4.05	.9999 8985	.9999 8210	.9999 7024	.9999 5286	.9999 2828
4.10	.9999 9274	.9999 8717	.9999 7862	.9999 6604	.9999 4820
4.15	.9999 9484	.9999 9085	.9999 8470	.9999 7565	.9999 6276
4.20	.9999 9634	.9999 9350	.9999 8910	.9999 8261	.9999 7335
4.25	.9999 9742	.9999 9540	.9999 9227	.9999 8764	.9999 8101
4.30	.9999 9818	.9999 9676	.9999 9454	.9999 9125	.9999 8653
4.35	.9999 9873	.9999 9772	.9999 9616	.9999 9384	.9999 9049
4.40	.9999 9911	.9999 9841	.9999 9731	.9999 9568	.9999 9332
4.45	.9999 9938	.9999 9889	.9999 9813	.9999 9698	.9999 9532
4.50	.9999 9957	.9999 9923	.9999 9870	.9999 9790	.9999 9674
4.55	.9999 9971	.9999 9947	.9999 9910	.9999 9854	.9999 9774
4.60	.9999 9980	.9999 9964	.9999 9938	.9999 9900	.9999 9844
4.65	.9999 9986	.9999 9975	.9999 9958	.9999 9931	.9999 9892
4.70	.9999 9991	.9999 9983	.9999 9971	.9999 9953	.9999 9926
4.75	.9999 9994	.9999 9988	.9999 9980	.9999 9968	.9999 9950
4.80	.9999 9996	.9999 9992	.9999 9987	.9999 9978	.9999 9966
4.85	.9999 9997	.9999 9995	.9999 9991	.9999 9985	.9999 9977
4.90	.9999 9998	.9999 9996	.9999 9994	.9999 9990	.9999 9984
4.95	.9999 9999	.9999 9998	.9999 9996	.9999 9993	.9999 9990
5.00	.9999 9999	.9999 9998	.9999 9997	.9999 9996	.9999 9993

W_2	$P(W_2,12)$	$P(W_2,13)$	$P(W_2,14)$	$P(W_2,15)$	$P(W_2,16)$
5.05	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9995
5.10	1.0000 0000	.9999 9999	.9999 9999	.9999 9998	.9999 9997
5.15		1.0000 0000	.9999 9999	.9999 9999	.9999 9998
5.20			.9999 9999	.9999 9999	.9999 9999
5.25			1.0000 0000	.9999 9999	.9999 9999
5.30				1.0000 0000	.9999 9999
5.35					1.0000 0000
5.40					
5.45					
5.50					
5.55					
5.60					
5.65					
5.70					
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7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_2	$P(W_2, .17)$	$P(W_2, .18)$	$P(W_2, .19)$	$P(W_2, .20)$	$P(W_2, .22)$
0.05					
0.10					
0.15					
0.20					
0.25	.0000 0000				
0.30	.0000 0002	.0000 0000			
0.35	.0000 0009	.0000 0002	.0000 0000		
0.40	.0000 0039	.0000 0008	.0000 0002	.0000 0000	
0.45	.0000 0142	.0000 0034	.0000 0008	.0000 0002	
0.50	.0000 0450	.0000 0119	.0000 0031	.0000 0008	.0000 0000
0.55	.0000 1255	.0000 0363	.0000 0103	.0000 0029	.0000 0002
0.60	.0000 3154	.0000 0992	.0000 0306	.0000 0093	.0000 0008
0.65	.0000 7264	.0000 2465	.0000 0823	.0000 0270	.0000 0028
0.70	.0001 5514	.0000 5651	.0000 2023	.0000 0714	.0000 0085
0.75	.0003 1040	.0001 2066	.0000 4612	.0000 1736	.0000 0237
0.80	.0005 8639	.0002 4216	.0000 9833	.0000 3934	.0000 0606
0.85	.0010 5286	.0004 5997	.0001 9762	.0000 8366	.0000 1443
0.90	.0018 0644	.0008 3178	.0003 7672	.0001 6813	.0000 3223
0.95	.0029 7524	.0014 3908	.0006 8476	.0003 2111	.0000 6799
1.00	.0047 2220	.0023 9207	.0011 9224	.0005 8570	.0001 3613
1.05	.0072 4653	.0038 3378	.0019 9599	.0010 2441	.0002 5995
1.10	.0107 8258	.0059 4279	.0032 2382	.0017 2423	.0004 7532
1.15	.0155 9572	.0089 3373	.0050 3796	.0028 0149	.0008 3514
1.20	.0219 7504	.0130 5512	.0076 3685	.0044 0587	.0014 1426
1.25	.0302 2292	.0185 8412	.0112 5441	.0067 2298	.0023 1462
1.30	.0406 4192	.0258 1802	.0161 5640	.0099 7480	.0036 6983
1.35	.0535 1972	.0350 6272	.0226 3359	.0144 1728	.0056 4887
1.40	.0691 1301	.0466 1867	.0309 9167	.0203 3484	.0084 5781
1.45	.0876 3149	.0607 6511	.0415 3827	.0280 3154	.0123 3924
1.50	.1092 2314	.0777 4362	.0545 6775	.0378 1906	.0175 6855
1.55	.1339 6194	.0977 4216	.0703 4466	.0500 0208	.0244 4685
1.60	.1618 3890	.1208 8081	.0890 8706	.0648 6190	.0332 9040
1.65	.1927 5717	.1472 0034	.1109 5088	.0826 3924	.0444 1703
1.70	.2265 3161	.1766 5447	.1360 1659	.1035 1770	.0581 2991
1.75	.2628 9296	.2091 0662	.1642 7927	.1276 0895	.0746 9996
1.80	.3014 9614	.2443 3119	.1956 4281	.1549 4101	.0943 4795
1.85	.3419 3238	.2820 1957	.2299 1891	.1854 5050	.1172 2773
1.90	.3837 4412	.3217 9033	.2668 3089	.2189 7962	.1434 1197
1.95	.4264 4187	.3632 0299	.3060 2219	.2552 7815	.1728 8160
2.00	.4695 2192	.4057 7436	.3470 6884	.2940 1035	.2055 1982
2.05	.5124 8395	.4489 9649	.3894 9526	.3347 6645	.2411 1151
2.10	.5548 4741	.4923 5502	.4327 9216	.3770 7774	.2793 4793
2.15	.5961 6615	.5353 4703	.4764 3545	.4204 3442	.3198 3654
2.20	.6360 4042	.5774 9726	.5199 0512	.4643 0493	.3621 1539
2.25	.6741 2606	.6183 7213	.5627 0286	.5081 5561	.4056 7086
2.30	.7101 4054	.6575 9088	.6043 6764	.5514 6946	.4499 5772
2.35	.7438 6605	.6948 3352	.6444 8858	.5937 6310	.4944 2012
2.40	.7751 4962	.7298 4564	.6827 1460	.6346 0105	.5385 1218
2.45	.8039 0079	.7624 4002	.7187 6065	.6736 0674	.5817 1698
2.50	.8300 8720	.7924 9540	.7524 1072	.7104 7014	.6235 6306

W_2	$P(W_2, .17)$	$P(W_2, .18)$	$P(W_2, .19)$	$P(W_2, .20)$	$P(W_2, .22)$
2.55	.8537 2855	.8199 5288	.7835 1756	.7449 5177	.6636 3756
2.60	.8748 8945	.8448 1032	.8119 9984	.7768 8336	.7015 9565
2.65	.8936 7168	.8671 1536	.8378 3697	.8061 6554	.7371 6616
2.70	.9102 0625	.8869 5756	.8610 6228	.8327 6307	.7701 5337
2.75	.9246 4563	.9044 6014	.8817 5506	.8566 9814	.8004 3546
2.80	.9371 5656	.9197 7174	.9000 3207	.8780 4228	.8279 6004
2.85	.9479 1341	.9330 5866	.9160 3888	.8969 0763	.8527 3741
2.90	.9570 9262	.9444 9761	.9299 4156	.9134 3793	.8748 3221
2.95	.9648 6784	.9542 6951	.9419 1902	.9277 9977	.8943 5408
3.00	.9714 0626	.9625 5408	.9521 5611	.9401 7444	.9114 4804
3.05	.9768 6562	.9695 2557	.9608 3785	.9507 5061	.9262 8488
3.10	.9813 9231	.9753 4940	.9681 4459	.9597 1806	.9390 5234
3.15	.9851 2002	.9801 7976	.9742 4827	.9672 6248	.9499 4697
3.20	.9881 6919	.9841 5805	.9793 0975	.9735 6144	.9591 6728
3.25	.9906 4688	.9874 1204	.9834 7690	.9787 8135	.9669 0796
3.30	.9926 4716	.9900 5561	.9868 8361	.9830 7545	.9733 5538
3.35	.9942 5173	.9921 8903	.9896 4945	.9865 8262	.9786 8428
3.40	.9955 3081	.9938 9952	.9918 7974	.9894 2694	.9830 5549
3.45	.9965 4414	.9952 6212	.9936 6622	.9917 1776	.9866 1462
3.50	.9973 4205	.9963 4074	.9950 8784	.9935 5029	.9894 9153
3.55	.9979 6660	.9971 8928	.9962 1185	.9950 0645	.9918 0046
3.60	.9984 5257	.9978 5274	.9970 9493	.9961 5598	.9936 4062
3.65	.9988 2851	.9983 6837	.9977 8442	.9970 5762	.9950 9714
3.70	.9991 1769	.9987 6675	.9983 1945	.9977 6036	.9962 4227
3.75	.9993 3886	.9990 7273	.9987 3214	.9983 0467	.9971 3664
3.80	.9995 0709	.9993 0641	.9990 4857	.9987 2369	.9978 3062
3.85	.9996 3434	.9994 8385	.9992 8977	.9990 4432	.9983 6570
3.90	.9997 3008	.9996 1785	.9994 7259	.9992 8821	.9987 7566
3.95	.9998 0172	.9997 1848	.9996 1035	.9994 7266	.9990 8784
4.00	.9998 5506	.9997 9363	.9997 1360	.9996 1134	.9993 2412
4.05	.9998 9455	.9998 4947	.9997 9054	.9997 1502	.9995 0188
4.10	.9999 2365	.9998 9073	.9998 4758	.9997 9211	.9996 3484
4.15	.9999 4498	.9999 2107	.9998 8963	.9998 4910	.9997 3371
4.20	.9999 6053	.9999 4325	.9999 2047	.9998 9102	.9998 0682
4.25	.9999 7182	.9999 5939	.9999 4296	.9999 2168	.9998 6057
4.30	.9999 7997	.9999 7108	.9999 5929	.9999 4399	.9998 9988
4.35	.9999 8583	.9999 7950	.9999 7108	.9999 6013	.9999 2846
4.40	.9999 9002	.9999 8553	.9999 7956	.9999 7176	.9999 4914
4.45	.9999 9300	.9999 8984	.9999 8561	.9999 8009	.9999 6402
4.50	.9999 9511	.9999 9289	.9999 8992	.9999 8603	.9999 7466
4.55	.9999 9660	.9999 9505	.9999 9297	.9999 9024	.9999 8225
4.60	.9999 9765	.9999 9657	.9999 9512	.9999 9322	.9999 8762
4.65	.9999 9838	.9999 9763	.9999 9663	.9999 9530	.9999 9141
4.70	.9999 9889	.9999 9837	.9999 9768	.9999 9677	.9999 9406
4.75	.9999 9924	.9999 9889	.9999 9841	.9999 9778	.9999 9592
4.80	.9999 9948	.9999 9924	.9999 9892	.9999 9848	.9999 9720
4.85	.9999 9965	.9999 9949	.9999 9926	.9999 9897	.9999 9809
4.90	.9999 9976	.9999 9965	.9999 9950	.9999 9930	.9999 9871
4.95	.9999 9984	.9999 9977	.9999 9967	.9999 9953	.9999 9913
5.00	.9999 9989	.9999 9984	.9999 9978	.9999 9968	.9999 9941

W_2	$P(W_2,17)$	$P(W_2,18)$	$P(W_2,19)$	$P(W_2,20)$	$P(W_2,22)$
5.05	.9999 9993	.9999 9990	.9999 9985	.9999 9979	.9999 9961
5.10	.9999 9995	.9999 9993	.9999 9990	.9999 9986	.9999 9974
5.15	.9999 9997	.9999 9995	.9999 9993	.9999 9991	.9999 9983
5.20	.9999 9998	.9999 9997	.9999 9996	.9999 9994	.9999 9988
5.25	.9999 9999	.9999 9998	.9999 9997	.9999 9996	.9999 9992
5.30	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9995
5.35	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9997
5.40	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9998
5.45		1.0000 0000	.9999 9999	.9999 9999	.9999 9999
5.50			1.0000 0000	1.0000 0000	.9999 9999
5.55					.9999 9999
5.60					1.0000 0000
5.65					
5.70					
5.75					
5.80					
5.85					
5.90					
5.95					
6.00					
6.05					
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6.95					
7.00					
7.05					
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7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_2	$P(W_2, .24)$	$P(W_2, .26)$	$P(W_2, .28)$	$P(W_2, .30)$	$P(W_2, .32)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55	.0000 0000				
0.60	.0000 0001				
0.65	.0000 0003	.0000 0000			
0.70	.0000 0010	.0000 0001			
0.75	.0000 0031	.0000 0004	.0000 0000		
0.80	.0000 0089	.0000 0013	.0000 0002	.0000 0000	
0.85	.0000 0238	.0000 0038	.0000 0006	.0000 0001	
0.90	.0000 0592	.0000 0105	.0000 0018	.0000 0003	.0000 0000
0.95	.0000 1379	.0000 0270	.0000 0051	.0000 0009	.0000 0002
1.00	.0000 3032	.0000 0652	.0000 0136	.0000 0028	.0000 0006
1.05	.0000 6324	.0000 1485	.0000 0339	.0000 0075	.0000 0016
1.10	.0001 2566	.0000 3208	.0000 0795	.0000 0192	.0000 0045
1.15	.0002 3883	.0000 6597	.0000 1770	.0000 0463	.0000 0118
1.20	.0004 3566	.0001 2967	.0000 3749	.0000 1057	.0000 0292
1.25	.0007 6505	.0002 4440	.0000 7584	.0000 2296	.0000 0680
1.30	.0012 9679	.0004 4301	.0001 4706	.0000 4763	.0000 1510
1.35	.0021 2674	.0007 7433	.0002 7401	.0000 9462	.0000 3198
1.40	.0033 8186	.0013 0817	.0004 9194	.0001 8056	.0000 6488
1.45	.0052 2432	.0021 4061	.0008 5292	.0003 3175	.0001 2636
1.50	.0078 5403	.0033 9924	.0014 3106	.0005 8825	.0002 3683
1.55	.0115 0889	.0052 4752	.0023 2806	.0010 0870	.0004 2813
1.60	.0164 6202	.0078 8762	.0036 7847	.0016 7581	.0007 4801
1.65	.0230 1556	.0115 6089	.0056 5416	.0027 0206	.0012 6541
1.70	.0314 9077	.0165 4533	.0084 6705	.0042 3505	.0020 7631
1.75	.0422 1472	.0231 4939	.0123 6934	.0064 6178	.0033 0950
1.80	.0555 0416	.0317 0203	.0176 5050	.0096 1084	.0051 3188
1.85	.0716 4730	.0425 3902	.0246 3041	.0139 5191	.0077 5210
1.90	.0908 8501	.0559 8622	.0336 4847	.0197 9157	.0114 2190
1.95	.1133 9274	.0723 4062	.0450 4896	.0274 6503	.0164 3409
2.00	.1392 6465	.0918 5058	.0591 6310	.0373 2367	.0231 1654
2.05	.1685 0136	.1146 9682	.0762 8904	.0497 1862	.0318 2175
2.10	.2010 0243	.1409 7558	.0966 7115	.0649 8128	.0429 1204
2.15	.2365 6434	.1706 8569	.1204 8031	.0834 0201	.0567 4098
2.20	.2748 8424	.2037 2058	.1477 9683	.1052 0854	.0736 3199
2.25	.3155 6931	.2398 6612	.1785 9762	.1305 4605	.0938 5573
2.30	.3581 5113	.2788 0474	.2127 4896	.1594 6054	.1176 0811
2.35	.4021 0397	.3201 2542	.2500 0547	.1918 8729	.1449 9080
2.40	.4468 6578	.3633 3908	.2900 1574	.2276 4538	.1759 9613
2.45	.4918 6047	.4078 9811	.3323 3424	.2664 3922	.2104 9798
2.50	.5365 1991	.4532 1878	.3764 3865	.3078 6695	.2482 4955

W_2	$P(W_2,.24)$	$P(W_2,.26)$	$P(W_2,.28)$	$P(W_2,.30)$	$P(W_2,.32)$
2.55	.5803 0451	.4987 0480	.4217 5133	.3514 3523	.2888 8859
2.60	.6227 2102	.5437 7064	.4676 6348	.3965 7942	.3319 4975
2.65	.6633 3699	.5878 6306	.5135 6010	.4426 8746	.3768 8320
2.70	.7017 9112	.6304 7965	.5588 4426	.4891 2594	.4230 7807
2.75	.7377 9946	.6711 8362	.6029 5903	.5352 6619	.4698 8900
2.80	.7711 5757	.7096 1414	.6454 0597	.5805 0903	.5166 6375
2.85	.8017 3892	.7454 9228	.6857 5932	.6243 0632	.5627 6999
2.90	.8294 9018	.7786 2250	.7236 7544	.6661 7848	.6076 1957
2.95	.8544 2397	.8088 9034	.7588 9738	.7057 2709	.6506 8880
3.00	.8766 0995	.8362 5674	.7912 5501	.7426 4231	.6915 3379
3.05	.8961 6476	.8607 4994	.8206 6114	.7767 0541	.7298 0045
3.10	.9132 4170	.8824 5558	.8471 0447	.8077 8654	.7652 2906
3.15	.9280 2057	.9015 0592	.8706 4008	.8358 3889	.7976 5371
3.20	.9406 9812	.9180 6877	.8913 7854	.8608 8970	.8269 9743
3.25	.9514 7964	.9323 3688	.9094 7421	.8830 2934	.8532 6380
3.30	.9605 7158	.9445 1805	.9251 1372	.9023 9925	.8765 2603
3.35	.9681 7564	.9548 2646	.9385 0492	.9191 7959	.8969 1458
3.40	.9744 8411	.9634 7535	.9498 6704	.9335 7731	.9146 0419
3.45	.9796 7648	.9706 7115	.9594 2210	.9458 1522	.9298 0111
3.50	.9839 1723	.9766 0896	.9673 8793	.9561 2234	.9427 3129
3.55	.9873 5458	.9814 6944	.9739 7264	.9647 2591	.9536 2975
3.60	.9901 2009	.9854 1686	.9793 7064	.9718 4492	.9627 3175
3.65	.9923 2892	.9885 9813	.9837 5999	.9776 8541	.9702 6554
3.70	.9940 8056	.9911 4267	.9873 0088	.9824 3711	.9764 4694
3.75	.9954 5994	.9931 6292	.9901 3518	.9862 7156	.9814 7550
3.80	.9965 3874	.9947 5533	.9923 8669	.9893 4119	.9855 3218
3.85	.9973 7678	.9960 0163	.9941 6193	.9917 7943	.9887 7819
3.90	.9980 2350	.9969 7027	.9955 5148	.9937 0140	.9913 5487
3.95	.9985 1935	.9977 1800	.9966 3137	.9952 0512	.9933 8431
4.00	.9988 9709	.9982 9133	.9974 6474	.9963 7301	.9949 7058
4.05	.9991 8306	.9987 2806	.9981 0346	.9972 7359	.9962 0121
4.10	.9993 9822	.9990 5860	.9985 8971	.9979 6317	.9971 4898
4.15	.9995 5914	.9993 0718	.9989 5743	.9984 8757	.9978 7369
4.20	.9996 7876	.9994 9297	.9992 3373	.9988 8367	.9984 2396
4.25	.9997 6717	.9996 3098	.9994 4002	.9991 8088	.9988 3891
4.30	.9998 3213	.9997 3289	.9995 9307	.9994 0244	.9991 4973
4.35	.9998 7960	.9998 0769	.9997 0592	.9995 6657	.9993 8101
4.40	.9999 1408	.9998 6227	.9997 8864	.9996 8739	.9995 5199
4.45	.9999 3900	.9999 0188	.9998 4891	.9997 7578	.9996 7759
4.50	.9999 5691	.9999 3046	.9998 9257	.9998 4005	.9997 6928
4.55	.9999 6971	.9999 5096	.9999 2401	.9998 8652	.9998 3582
4.60	.9999 7881	.9999 6560	.9999 4653	.9999 1992	.9998 8380
4.65	.9999 8525	.9999 7598	.9999 6257	.9999 4378	.9999 1820
4.70	.9999 8978	.9999 8332	.9999 7393	.9999 6074	.9999 4273
4.75	.9999 9295	.9999 8847	.9999 8193	.9999 7272	.9999 6011
4.80	.9999 9516	.9999 9207	.9999 8754	.9999 8114	.9999 7236
4.85	.9999 9670	.9999 9457	.9999 9145	.9999 8703	.9999 8094
4.90	.9999 9775	.9999 9630	.9999 9416	.9999 9112	.9999 8693
4.95	.9999 9848	.9999 9749	.9999 9603	.9999 9395	.9999 9108
5.00	.9999 9898	.9999 9830	.9999 9731	.9999 9590	.9999 9394

W_2	$P(W_2, .24)$	$P(W_2, .26)$	$P(W_2, .28)$	$P(W_2, .30)$	$P(W_2, .32)$
5.05	.9999 9931	.9999 9886	.9999 9819	.9999 9723	.9999 9590
5.10	.9999 9954	.9999 9924	.9999 9879	.9999 9814	.9999 9725
5.15	.9999 9969	.9999 9949	.9999 9919	.9999 9876	.9999 9816
5.20	.9999 9980	.9999 9966	.9999 9946	.9999 9917	.9999 9877
5.25	.9999 9987	.9999 9978	.9999 9964	.9999 9945	.9999 9919
5.30	.9999 9991	.9999 9985	.9999 9977	.9999 9964	.9999 9946
5.35	.9999 9994	.9999 9990	.9999 9985	.9999 9976	.9999 9965
5.40	.9999 9996	.9999 9994	.9999 9990	.9999 9985	.9999 9977
5.45	.9999 9998	.9999 9996	.9999 9993	.9999 9990	.9999 9985
5.50	.9999 9998	.9999 9997	.9999 9996	.9999 9993	.9999 9990
5.55	.9999 9999	.9999 9998	.9999 9997	.9999 9996	.9999 9994
5.60	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9996
5.65	1.0000 0000	.9999 9999	.9999 9999	.9999 9998	.9999 9997
5.70		1.0000 0000	.9999 9999	.9999 9999	.9999 9998
5.75			1.0000 0000	.9999 9999	.9999 9999
5.80				1.0000 0000	.9999 9999
5.85					1.0000 0000
5.90					
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
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6.30					
6.35					
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6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_2	$P(W_2, .34)$	$P(W_2, .36)$	$P(W_2, .38)$	$P(W_2, .40)$	$P(W_2, .50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95	.0000 0000				
1.00	.0000 0001	.0000 0000			
1.05	.0000 0003	.0000 0001	.0000 0000		
1.10	.0000 0011	.0000 0002	.0000 0001		
1.15	.0000 0030	.0000 0007	.0000 0002	.0000 0000	
1.20	.0000 0079	.0000 0021	.0000 0006	.0000 0001	
1.25	.0000 0198	.0000 0057	.0000 0016	.0000 0004	
1.30	.0000 0470	.0000 0144	.0000 0043	.0000 0013	
1.35	.0000 1061	.0000 0346	.0000 0111	.0000 0035	
1.40	.0000 2289	.0000 0794	.0000 0272	.0000 0092	.0000 0000
1.45	.0000 4725	.0000 1738	.0000 0630	.0000 0226	.0000 0001
1.50	.0000 9362	.0000 3641	.0000 1396	.0000 0528	.0000 0094
1.55	.0001 7844	.0000 7319	.0000 2959	.0000 1181	.0000 0010
1.60	.0003 2792	.0001 4148	.0000 6018	.0000 2527	.0000 0028
1.65	.0005 8214	.0002 6360	.0001 1769	.0000 5188	.0000 0074
1.70	.0010 0012	.0004 7424	.0002 2175	.0001 0239	.0000 0185
1.75	.0016 6564	.0008 2537	.0004 0335	.0001 9466	.0000 0438
1.80	.0026 9330	.0013 9191	.0007 0950	.0003 5720	.0000 0995
1.85	.0042 3436	.0022 7795	.0012 0886	.0006 3368	.0000 2162
1.90	.0064 8148	.0036 2306	.0019 9809	.0010 8860	.0000 4510
1.95	.0096 7140	.0056 0765	.0032 0831	.0018 1360	.0000 9045
2.00	.0140 8468	.0084 5678	.0050 1116	.0029 3427	.0001 7477
2.05	.0200 4142	.0124 4112	.0076 2326	.0046 1649	.0003 2582
2.10	.0278 9270	.0178 7420	.0113 0820	.0070 7158	.0005 8698
2.15	.0380 0723	.0251 0524	.0163 7490	.0105 5893	.0010 2340
2.20	.0507 5366	.0345 0702	.0231 7153	.0153 8524	.0017 2920
2.25	.0664 7945	.0464 5909	.0320 7434	.0218 9914	.0028 3527
2.30	.0854 8767	.0613 2688	.0434 7149	.0304 8076	.0045 1683
2.35	.1080 1352	.0794 3809	.0577 4237	.0415 2585	.0069 9968
2.40	.1342 0260	.1010 5812	.0752 3363	.0554 2518	.0105 6384
2.45	.1640 9311	.1263 6665	.0962 3370	.0725 4014	.0155 4307
2.50	.1976 0350	.1554 3749	.1209 4797	.0931 7643	.0223 1907

W_2	$P(W_2, .34)$	$P(W_2, .36)$	$P(W_2, .38)$	$P(W_2, .40)$	$P(W_2, .50)$
2.55	.2345 2729	.1882 2386	.1494 7683	.1175 5801	.0313 0955
2.60	.2745 3547	.2245 5061	.1817 9896	.1458 0371	.0429 4978
2.65	.3171 8664	.2641 1436	.2177 6158	.1779 0900	.0576 6826
2.70	.3619 4425	.3064 9188	.2570 7883	.2137 3472	.0758 5794
2.75	.4081 9945	.3511 5611	.2993 3885	.2530 0429	.0978 4521
2.80	.4552 9803	.3974 9872	.3440 1904	.2953 0996	.1238 5943
2.85	.5025 6912	.4448 5721	.3905 0838	.3401 2773	.1540 0611
2.90	.5493 5377	.4925 4472	.4381 3508	.3868 3989	.1882 4675
2.95	.5950 3137	.5398 8008	.4861 9729	.4347 6330	.2263 8765
3.00	.6390 4228	.5862 1604	.5339 9450	.4831 8108	.2680 7921
3.05	.6809 0561	.6309 6392	.5808 5738	.5313 7536	.3128 2642
3.10	.7202 3125	.6736 1331	.6261 7408	.5786 5842	.3600 0955
3.15	.7567 2628	.7137 4585	.6694 1141	.6244 0039	.4089 1347
3.20	.7901 9573	.7510 4304	.7101 3005	.6680 5157	.4587 6310
3.25	.8205 3863	.7852 8804	.7479 9328	.7091 5851	.5087 6172
3.30	.8477 3996	.8163 6232	.7827 6954	.7473 7346	.5581 2922
3.35	.8718 5980	.8442 3789	.8143 2934	.7824 5709	.6061 3713
3.40	.8930 2062	.8689 6632	.8426 3752	.8142 7551	.6521 3816
3.45	.9113 9367	.8906 6561	.8677 4200	.8427 9222	.6955 8852
3.50	.9271 8559	.9095 0614	.8897 6024	.8680 5644	.7360 6208
3.55	.9406 2571	.9256 9652	.9088 6459	.8901 8903	.7732 5642
3.60	.9519 5471	.9394 7023	.9252 6752	.9093 6724	.8069 9128
3.65	.9614 1496	.9510 7363	.9392 0770	.9258 0938	.8372 0059
3.70	.9692 4268	.9607 5562	.9509 3737	.9397 6034	.8639 1961
3.75	.9756 6192	.9687 5937	.9607 1162	.9514 7857	.8872 6871
3.80	.9808 8036	.9753 1582	.9687 7964	.9612 2497	.9074 3553
3.85	.9850 8661	.9806 3920	.9753 7804	.9692 5395	.9246 5675
3.90	.9884 4888	.9849 2409	.9807 2611	.9758 0656	.9392 0087
3.95	.9911 1472	.9883 4401	.9850 2283	.9811 0573	.9513 5265
4.00	.9932 1165	.9910 5110	.9884 4538	.9853 5329	.9613 9997
4.05	.9948 4830	.9931 7670	.9911 4887	.9887 2852	.9696 2318
4.10	.9961 1601	.9948 3259	.9932 6698	.9913 8795	.9762 8713
4.15	.9970 9069	.9961 1265	.9949 1326	.9934 6615	.9816 3570
4.20	.9978 3462	.9970 9475	.9961 8285	.9950 7709	.9858 8845
4.25	.9983 9840	.9978 4270	.9971 5451	.9963 1602	.9892 3913
4.30	.9988 2268	.9984 0823	.9978 9262	.9972 6155	.9918 5571
4.35	.9991 3981	.9988 3282	.9984 4924	.9979 7775	.9938 8137
4.40	.9993 7526	.9991 4939	.9988 6601	.9985 1626	.9954 3638
4.45	.9995 4893	.9993 8384	.9991 7590	.9989 1826	.9966 2029
4.50	.9996 7620	.9995 5631	.9994 0475	.9992 1626	.9975 1445
4.55	.9997 6888	.9996 8237	.9995 7261	.9994 3564	.9981 8451
4.60	.9998 3596	.9997 7392	.9996 9495	.9995 9606	.9986 8280
4.65	.9998 8421	.9998 3999	.9997 8352	.9997 1259	.9990 5060
4.70	.9999 1872	.9998 8739	.9998 4726	.9997 9669	.9993 2011
4.75	.9999 4325	.9999 2118	.9998 9283	.9998 5701	.9995 1619
4.80	.9999 6058	.9999 4513	.9999 2522	.9999 0000	.9996 5786
4.85	.9999 7276	.9999 6200	.9999 4811	.9999 3045	.9997 5952
4.90	.9999 8128	.9999 7383	.9999 6418	.9999 5190	.9998 3198
4.95	.9999 8720	.9999 8207	.9999 7541	.9999 6691	.9998 8330
5.00	.9999 9129	.9999 8777	.9999 8320	.9999 7736	.9999 1942

W_2	$P(W_2, .34)$	$P(W_2, .36)$	$P(W_2, .38)$	$P(W_2, .40)$	$P(W_2, .50)$
5.05	.9999 9410	.9999 9171	.9999 8859	.9999 8459	.9999 4467
5.10	.9999 9603	.9999 9440	.9999 9228	.9999 8956	.9999 6222
5.15	.9999 9733	.9999 9624	.9999 9481	.9999 9297	.9999 7435
5.20	.9999 9822	.9999 9749	.9999 9652	.9999 9528	.9999 8268
5.25	.9999 9882	.9999 9833	.9999 9769	.9999 9685	.9999 8836
5.30	.9999 9922	.9999 9889	.9999 9847	.9999 9791	.9999 9222
5.35	.9999 9949	.9999 9927	.9999 9899	.9999 9862	.9999 9483
5.40	.9999 9966	.9999 9952	.9999 9934	.9999 9909	.9999 9658
5.45	.9999 9978	.9999 9969	.9999 9957	.9999 9941	.9999 9775
5.50	.9999 9986	.9999 9980	.9999 9972	.9999 9961	.9999 9853
5.55	.9999 9991	.9999 9987	.9999 9982	.9999 9975	.9999 9904
5.60	.9999 9994	.9999 9992	.9999 9988	.9999 9984	.9999 9938
5.65	.9999 9996	.9999 9995	.9999 9992	.9999 9990	.9999 9960
5.70	.9999 9998	.9999 9997	.9999 9995	.9999 9993	.9999 9974
5.75	.9999 9998	.9999 9998	.9999 9997	.9999 9996	.9999 9984
5.80	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9990
5.85	.9999 9999	.9999 9999	.9999 9999	.9999 9998	.9999 9993
5.90	1.0000 0000	.9999 9999	.9999 9999	.9999 9999	.9999 9996
5.95		1.0000 0000	1.0000 0000	.9999 9999	.9999 9997
6.00				1.0000 0000	.9999 9998
6.05					.9999 9999
6.10					.9999 9999
6.15					1.0000 0000
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_2	$P(W_2, .60)$	$P(W_2, .70)$	$P(W_2, .80)$	$P(W_2, .90)$	$P(W_2, 1.00)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20					
1.25					
1.30					
1.35					
1.40					
1.45					
1.50					
1.55					
1.60	.0000 0000				
1.65	.0000 0001				
1.70	.0000 0003				
1.75	.0000 0008				
1.80	.0000 0023	.0000 0000			
1.85	.0000 0061	.0000 0002			
1.90	.0000 0156	.0000 0005			
1.95	.0000 0377	.0000 0014	.0000 0000		
2.00	.0000 0870	.0000 0038	.0000 0002		
2.05	.0000 1925	.0000 0100	.0000 0005	.0000 0000	
2.10	.0000 4085	.0000 0251	.0000 0014	.0000 0001	
2.15	.0000 8330	.0000 0600	.0000 0039	.0000 0002	.0000 0000
2.20	.0001 6350	.0000 1369	.0000 0105	.0000 0007	.0000 0001
2.25	.0003 0939	.0000 2993	.0000 0265	.0000 0022	.0000 0002
2.30	.0005 6527	.0000 6277	.0000 0638	.0000 0061	.0000 0005
2.35	.0009 9859	.0001 2655	.0000 1469	.0000 0159	.0000 0016
2.40	.0017 0796	.0002 4560	.0000 3236	.0000 0399	.0000 0047
2.45	.0028 3202	.0004 5953	.0000 6838	.0000 0951	.0000 0125
2.50	.0045 5804	.0008 3012	.0001 3875	.0000 2170	.0000 0322

W_2	$P(W_2,60)$	$P(W_2,70)$	$P(W_2,80)$	$P(W_2,90)$	$P(W_2,100)$
2.55	.0071 2918	.0014 4979	.0002 7081	.0000 4735	.0000 0785
2.60	.0108 4867	.0024 5121	.0005 0919	.0000 9907	.0000 1829
2.65	.0160 7930	.0040 1716	.0009 2364	.0001 9904	.0000 4072
2.70	.0232 3666	.0063 8928	.0016 1854	.0003 8453	.0000 8677
2.75	.0327 7508	.0098 7395	.0027 4364	.0007 1551	.0001 7732
2.80	.0451 6605	.0148 4337	.0045 0476	.0012 8411	.0003 4803
2.85	.0608 6982	.0217 2987	.0071 7298	.0022 2584	.0006 5708
2.90	.0803 0199	.0310 1219	.0110 9007	.0037 3144	.0011 9511
2.95	.1037 9793	.0431 9302	.0166 6804	.0060 5777	.0020 9706
3.00	.1315 7850	.0587 6851	.0243 8068	.0095 3565	.0035 5488
3.05	.1637 2073	.0781 9166	.0347 4568	.0145 7211	.0058 2957
3.10	.2001 3706	.1018 3260	.0482 9709	.0216 4452	.0092 6008
3.15	.2405 6566	.1299 3982	.0655 4926	.0312 8483	.0142 6630
3.20	.2845 7357	.1626 0674	.0869 5487	.0440 5293	.0213 4351
3.25	.3315 7260	.1997 4765	.1128 6105	.0605 0011	.0310 4600
3.30	.3808 4696	.2410 8636	.1434 6835	.0811 2485	.0439 5883
3.35	.4315 8988	.2861 5936	.1787 9761	.1063 2515	.0606 5870
3.40	.4829 4596	.3343 3376	.2186 6906	.1363 5261	.0816 6638
3.45	.5340 5552	.3848 3846	.2626 9679	.1712 7385	.1073 9535
3.50	.5840 9696	.4368 0558	.3102 9994	.2109 4446	.1381 0240
3.55	.6323 2403	.4893 1823	.3607 2980	.2549 9941	.1738 4649
3.60	.6780 9541	.5414 6002	.4131 1039	.3028 6183	.2144 6162
3.65	.7208 9513	.5923 6197	.4664 8829	.3537 6968	.2595 4773
3.70	.7603 4327	.6412 4311	.5198 8693	.4068 1791	.3084 8188
3.75	.7961 9739	.6874 4192	.5723 5997	.4610 1158	.3604 4879
3.80	.8283 4584	.7304 3704	.6230 3927	.5153 2456	.4144 8783
3.85	.8567 9475	.7698 5697	.6711 7374	.5687 5790	.4695 5134
3.90	.8816 5041	.8054 7934	.7161 5666	.6203 9258	.5245 6809
3.95	.9030 9920	.8372 2141	.7575 4055	.6694 3243	.5785 0550
4.00	.9213 8679	.8651 2383	.7950 4012	.7152 3442	.6304 2482
4.05	.9367 9809	.8893 2993	.8285 2462	.7573 2531	.6795 2481
4.10	.9496 3908	.9100 6280	.8580 0194	.7954 0493	.7251 7139
4.15	.9602 2127	.9276 0223	.8835 9698	.8293 3792	.7669 1223
4.20	.9688 4925	.9422 6299	.9055 2691	.8591 3635	.8044 7722
4.25	.9758 1120	.9543 7567	.9240 7569	.8849 3606	.8377 6682
4.30	.9813 7237	.9642 7074	.9395 6981	.9069 6980	.8668 3136
4.35	.9857 7125	.9722 6611	.9523 5663	.9255 3960	.8918 4435
4.40	.9892 1770	.9786 5816	.9627 8619	.9409 9068	.9130 7313
4.45	.9918 9301	.9837 1595	.9711 9693	.9536 8832	.9308 4952
4.50	.9939 5106	.9876 7808	.9779 0535	.9639 9868	.9455 4271
4.55	.9955 2041	.9907 5186	.9831 9919	.9722 7383	.9575 3576
4.60	.9967 0692	.9931 1403	.9873 3370	.9788 4120	.9672 0660
4.65	.9975 9655	.9949 1273	.9905 3051	.9839 9674	.9749 1373
4.70	.9982 5819	.9962 7021	.9929 7833	.9880 0145	.9809 8643
4.75	.9987 4640	.9972 8584	.9948 3499	.9910 8054	.9857 1892
4.80	.9991 0386	.9980 3931	.9962 3040	.9934 2461	.9893 6790
4.85	.9993 6364	.9985 9373	.9972 6983	.9951 9202	.9921 5256
4.90	.9995 5105	.9989 9842	.9980 3742	.9965 1227	.9942 5649
4.95	.9996 8528	.9992 9154	.9985 9950	.9974 8960	.9958 3079
5.00	.9997 8076	.9995 0223	.9990 0774	.9982 0675	.9969 9777

W_2	$P(W_2,.60)$	$P(W_2,.70)$	$P(W_2,.80)$	$P(W_2,.90)$	$P(W_2,.100)$
5.05	.9998 4821	.9996 5256	.9993 0189	.9987 2851	.9978 5499
5.10	.9998 9554	.9997 5904	.9995 1220	.9991 0498	.9984 7913
5.15	.9999 2853	.9998 3395	.9996 6143	.9993 7444	.9989 2968
5.20	.9999 5139	.9998 8627	.9997 6655	.9995 6579	.9992 5223
5.25	.9999 6713	.9999 2258	.9998 4006	.9997 0065	.9994 8129
5.30	.9999 7789	.9999 4761	.9998 9111	.9997 9498	.9996 4268
5.35	.9999 8521	.9999 6476	.9999 2632	.9998 6050	.9997 5552
5.40	.9999 9017	.9999 7643	.9999 5045	.9999 0568	.9998 3383
5.45	.9999 9349	.9999 8432	.9999 6687	.9999 3662	.9998 8779
5.50	.9999 9572	.9999 8963	.9999 7798	.9999 5767	.9999 2471
5.55	.9999 9720	.9999 9318	.9999 8545	.9999 7190	.9999 4980
5.60	.9999 9817	.9999 9554	.9999 9044	.9999 8145	.9999 6673
5.65	.9999 9882	.9999 9709	.9999 9375	.9999 8783	.9999 7808
5.70	.9999 9924	.9999 9812	.9999 9594	.9999 9206	.9999 8564
5.75	.9999 9951	.9999 9879	.9999 9737	.9999 9485	.9999 9065
5.80	.9999 9969	.9999 9922	.9999 9831	.9999 9667	.9999 9395
5.85	.9999 9980	.9999 9950	.9999 9892	.9999 9786	.9999 9610
5.90	.9999 9987	.9999 9969	.9999 9931	.9999 9864	.9999 9750
5.95	.9999 9992	.9999 9980	.9999 9956	.9999 9913	.9999 9841
6.00	.9999 9995	.9999 9988	.9999 9972	.9999 9945	.9999 9899
6.05	.9999 9997	.9999 9992	.9999 9983	.9999 9966	.9999 9936
6.10	.9999 9998	.9999 9995	.9999 9989	.9999 9978	.9999 9960
6.15	.9999 9999	.9999 9997	.9999 9993	.9999 9987	.9999 9975
6.20	.9999 9999	.9999 9998	.9999 9996	.9999 9992	.9999 9985
6.25	1.0000 0000	.9999 9999	.9999 9997	.9999 9995	.9999 9990
6.30		.9999 9999	.9999 9998	.9999 9997	.9999 9994
6.35		1.0000 0000	.9999 9999	.9999 9998	.9999 9996
6.40			.9999 9999	.9999 9999	.9999 9998
6.45			1.0000 0000	.9999 9999	.9999 9999
6.50				1.0000 0000	.9999 9999
6.55					1.0000 0000
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_3	$P(W_3,7)$	$P(W_3,8)$	$P(W_3,9)$	$P(W_3,10)$	$P(W_3,11)$
0.05		.1364 4517	.0110 7490	.0006 8032	.0000 3491
0.10		.2567 2838	.0407 7666	.0049 5438	.0005 0507
0.15		.3623 8128	.0843 7925	.0151 9583	.0023 0669
0.20		.4548 4652	.1378 5826	.0326 8276	.0065 6238
0.25		.5354 7480	.1978 3403	.0578 3421	.0143 9129
0.30		.6055 2339	.2615 1265	.0904 2056	.0267 5098
0.35		.6661 5597	.3266 2602	.1297 4674	.0443 4018
0.40		.7184 4358	.3913 7249	.1748 0821	.0675 5122
0.45		.7633 6662	.4543 5897	.2244 2073	.0964 6141
0.50		.8018 1776	.5145 4557	.2773 2509	.1308 5328
0.55		.8346 0542	.5711 9347	.3322 6894	.1702 5452
0.60		.8624 5799	.6238 1656	.3880 6801	.2139 8993
0.65		.8860 2830	.6721 3715	.4436 4917	.2612 3864
0.70		.9058 9855	.7160 4615	.4980 7799	.3110 9158
0.75		.9225 8527	.7555 6757	.5505 7341	.3626 0516
0.80		.9365 4450	.7908 2756	.6005 1199	.4148 4849
0.85		.9481 7682	.8220 2757	.6474 2410	.4669 4251
0.90		.9578 3243	.8494 2168	.6909 8411	.5180 9015
0.95		.9658 1592	.8732 9765	.7309 9652	.5675 9765
1.00		.9723 9097	.8939 6143	.7673 7953	.6148 8743
1.05		.9777 8474	.9117 2473	.8001 4742	.6595 0342
1.10		.9821 9195	.9268 9545	.8293 9275	.7011 1006
1.15		.9857 7877	.9397 7041	.8552 6928	.7394 8620
1.20		.9886 8627	.9506 3010	.8779 7605	.7745 1516
1.25		.9910 3369	.9597 3527	.8977 4315	.8061 7228
1.30		.9929 2130	.9673 2479	.9148 1928	.8345 1089
1.35		.9944 3305	.9736 1473	.9294 6136	.8596 4782
1.40		.9956 3889	.9787 9830	.9419 2590	.8817 4911
1.45		.9965 9682	.9830 4646	.9524 6238	.9010 1654
1.50		.9973 5471	.9865 0901	.9613 0811	.9176 7545
1.55		.9979 5188	.9893 1603	.9686 8479	.9319 6407
1.60		.9984 2048	.9915 7952	.9747 9610	.9441 2450
1.65		.9987 8669	.9933 9510	.9798 2662	.9543 9536
1.70		.9990 7169	.9948 4381	.9839 4135	.9630 0612
1.75		.9992 9258	.9959 9381	.9872 8614	.9701 7291
1.80		.9994 6306	.9969 0199	.9899 8845	.9760 9559
1.85		.9995 9410	.9976 1556	.9921 5853	.9809 5611
1.90		.9996 9439	.9981 7338	.9938 9085	.9849 1773
1.95		.9997 7084	.9986 0725	.9952 6559	.9881 2502
2.00		.9998 2886	.9989 4302	.9963 5022	.9907 0444
2.05		.9998 7271	.9992 0158	.9972 0106	.9927 6540
2.10		.9999 0571	.9993 9969	.9978 6469	.9944 0155
2.15		.9999 3044	.9995 5075	.9983 7939	.9956 9222
2.20		.9999 4890	.9996 6535	.9987 7635	.9967 0399
2.25		.9999 6261	.9997 5188	.9990 8081	.9974 9221
2.30		.9999 7276	.9998 1688	.9993 1304	.9981 0254
2.35		.9999 8024	.9998 6548	.9994 8921	.9985 7225
2.40		.9999 8572	.9999 0164	.9996 2212	.9989 3158
2.45		.9999 8972	.9999 2841	.9997 2185	.9992 0484
2.50		.9999 9264	.9999 4813	.9997 9630	.9994 1143

W_3	$P(W_3,7)$	$P(W_3,8)$	$P(W_3,9)$	$P(W_3,10)$	$P(W_3,11)$
2.55		.9999 9475	.9999 6260	.9998 5156	.9995 6669
2.60		.9999 9627	.9999 7315	.9998 9238	.9996 8271
2.65		.9999 9736	.9999 8082	.9999 2236	.9997 6891
2.70		.9999 9814	.9999 8636	.9999 4426	.9998 3258
2.75		.9999 9869	.9999 9034	.9999 6019	.9998 7936
2.80		.9999 9909	.9999 9319	.9999 7170	.9999 1352
2.85		.9999 9937	.9999 9523	.9999 7999	.9999 3834
2.90		.9999 9956	.9999 9667	.9999 8591	.9999 5626
2.95		.9999 9970	.9999 9768	.9999 9014	.9999 6914
3.00		.9999 9979	.9999 9840	.9999 9313	.9999 7833
3.05		.9999 9986	.9999 9890	.9999 9523	.9999 8487
3.10		.9999 9990	.9999 9924	.9999 9671	.9999 8949
3.15		.9999 9993	.9999 9948	.9999 9774	.9999 9273
3.20		.9999 9996	.9999 9965	.9999 9846	.9999 9500
3.25		.9999 9997	.9999 9976	.9999 9895	.9999 9658
3.30		.9999 9998	.9999 9984	.9999 9929	.9999 9767
3.35		.9999 9999	.9999 9989	.9999 9952	.9999 9842
3.40		.9999 9999	.9999 9993	.9999 9968	.9999 9894
3.45		.9999 9999	.9999 9995	.9999 9979	.9999 9929
3.50		1.0000 0000	.9999 9997	.9999 9986	.9999 9953
3.55			.9999 9998	.9999 9991	.9999 9969
3.60			.9999 9999	.9999 9994	.9999 9979
3.65			.9999 9999	.9999 9996	.9999 9986
3.70			.9999 9999	.9999 9997	.9999 9991
3.75			1.0000 0000	.9999 9998	.9999 9994
3.80				.9999 9999	.9999 9996
3.85				.9999 9999	.9999 9998
3.90				1.0000 0000	.9999 9998
3.95					.9999 9999
4.00					.9999 9999
4.05					1.0000 0000
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_3	$P(W_3,12)$	$P(W_3,13)$	$P(W_3,14)$	$P(W_3,15)$	$P(W_3,16)$
0.05	.0000 0158	.0000 0006	.0000 0000	.0000 0000	
0.10	.0000 4542	.0000 0372	.0000 0028	.0000 0002	.0000 0000
0.15	.0003 0962	.0000 3786	.0000 0430	.0000 0046	.0000 0005
0.20	.0011 6798	.0001 8963	.0000 2863	.0000 0408	.0000 0055
0.25	.0031 8248	.0006 4294	.0001 2092	.0000 2146	.0000 0363
0.30	.0070 5248	.0017 0125	.0003 8241	.0000 8115	.0000 1642
0.35	.0135 4156	.0037 9042	.0009 8968	.0002 4413	.0000 5743
0.40	.0233 9795	.0074 4104	.0022 0983	.0006 2047	.0001 6624
0.45	.0372 8066	.0132 5353	.0044 0513	.0013 8536	.0004 1598
0.50	.0556 9916	.0218 5153	.0080 2482	.0027 9079	.0009 2721
0.55	.0789 7104	.0338 3004	.0135 8407	.0051 6989	.0018 8087
0.60	.1071 9926	.0497 0476	.0216 3229	.0089 3179	.0035 2767
0.65	.1402 6831	.0698 6798	.0327 1407	.0145 4638	.0061 9145
0.70	.1778 5685	.0945 5502	.0473 2717	.0225 1950	.0102 6470
0.75	.2194 6362	.1238 2372	.0658 8202	.0333 6082	.0161 9529
0.80	.2644 4274	.1575 4785	.0886 6676	.0475 4754	.0244 6475
0.85	.3120 4444	.1954 2374	.1158 2107	.0654 8728	.0355 5958
0.90	.3614 5772	.2369 8853	.1473 2087	.0874 8414	.0499 3807
0.95	.4118 5164	.2816 4754	.1829 7476	.1137 1102	.0679 9570
1.00	.4624 1296	.3287 0783	.2224 3191	.1441 9075	.0900 3243
1.05	.5123 7816	.3774 1492	.2652 0006	.1787 8764	.1162 2521
1.10	.5610 5887	.4269 8979	.3106 7163	.2172 0976	.1466 0806
1.15	.6078 6022	.4766 6383	.3581 5534	.2590 2148	.1810 6181
1.20	.6522 9215	.5257 0955	.4069 1067	.3036 6486	.2193 1402
1.25	.6939 7432	.5734 6596	.4561 8255	.3504 8761	.2609 4905
1.30	.7326 3527	.6193 5757	.5052 3399	.3987 7536	.3054 2719
1.35	.7681 0695	.6629 0701	.5533 7473	.4477 8555	.3521 1086
1.40	.8003 1565	.7037 4133	.5999 8464	.4967 8052	.4002 9569
1.45	.8292 7054	.7415 9264	.6445 3107	.5450 5773	.4492 4399
1.50	.8550 5058	.7762 9401	.6865 7995	.5919 7540	.4982 1798
1.55	.8777 9107	.8077 7149	.7258 0079	.6369 7256	.5465 1064
1.60	.8976 7018	.8360 3339	.7619 6628	.6795 8293	.5934 7249
1.65	.9148 9646	.8611 5785	.7949 4716	.7194 4257	.6385 3279
1.70	.9296 9732	.8832 7953	.8247 0365	.7562 9170	.6812 1466
1.75	.9423 0922	.9025 7642	.8512 7407	.7899 7146	.7211 4388
1.80	.9529 6927	.9192 5716	.8747 6216	.8204 1648	.7580 5158
1.85	.9619 0855	.9335 4951	.8953 2354	.8476 4438	.7917 7169
1.90	.9693 4708	.9456 9030	.9131 5253	.8717 4325	.8222 3383
1.95	.9754 9005	.9559 1690	.9284 6962	.8928 5808	.8494 5293
2.00	.9805 2554	.9644 6044	.9415 1023	.9111 7709	.8735 1654
2.05	.9846 2319	.9715 4057	.9525 1506	.9269 1859	.8945 7103
2.10	.9879 3383	.9773 6174	.9617 2202	.9403 1905	.9128 0745
2.15	.9905 8982	.9821 1084	.9693 5996	.9516 2262	.9284 4802
2.20	.9927 0585	.9859 5589	.9756 4395	.9610 7239	.9417 3370
2.25	.9943 8019	.9890 4578	.9807 7216	.9689 0338	.9529 1332
2.30	.9956 9613	.9915 1059	.9849 2389	.9753 3737	.9622 3448
2.35	.9967 2351	.9934 6258	.9882 5883	.9805 7920	.9699 3637
2.40	.9975 2037	.9949 9743	.9909 1711	.9848 1459	.9762 4429
2.45	.9981 3442	.9961 9584	.9930 2001	.9882 0907	.9813 6594
2.50	.9986 0456	.9971 2506	.9946 7121	.9909 0798	.9854 8920

W_3	$P(W_3,12)$	$P(W_3,13)$	$P(W_3,14)$	$P(W_3,15)$	$P(W_3,16)$
2.55	.9989 6226	.9978 4066	.9959 5822	.9930 3706	.9887 8107
2.60	.9992 3269	.9983 8802	.9969 5413	.9947 0368	.9913 8771
2.65	.9994 3589	.9988 0390	.9977 1929	.9959 9842	.9934 3517
2.70	.9995 8762	.9991 1782	.9983 0304	.9969 9674	.9950 3068
2.75	.9997 0024	.9993 5323	.9987 4531	.9977 6085	.9962 6433
2.80	.9997 8332	.9995 2862	.9990 7808	.9983 4144	.9972 1088
2.85	.9998 4425	.9996 5847	.9993 2678	.9987 7944	.9979 3166
2.90	.9998 8867	.9997 5399	.9995 1140	.9991 0753	.9984 7644
2.95	.9999 2085	.9998 2382	.9996 4754	.9993 5157	.9988 8517
3.00	.9999 4404	.9998 7456	.9997 4729	.9995 3185	.9991 8960
3.05	.9999 6065	.9999 1119	.9998 1989	.9996 6412	.9994 1474
3.10	.9999 7248	.9999 3749	.9998 7239	.9997 6051	.9995 8005
3.15	.9999 8086	.9999 5624	.9999 1013	.9998 3029	.9997 0060
3.20	.9999 8676	.9999 6955	.9999 3707	.9998 8047	.9997 8789
3.25	.9999 9089	.9999 7892	.9999 5620	.9999 1633	.9998 5068
3.30	.9999 9376	.9999 8549	.9999 6969	.9999 4178	.9998 9554
3.35	.9999 9575	.9999 9007	.9999 7914	.9999 5973	.9999 2737
3.40	.9999 9712	.9999 9324	.9999 8573	.9999 7231	.9999 4981
3.45	.9999 9806	.9999 9542	.9999 9029	.9999 8107	.9999 6553
3.50	.9999 9870	.9999 9692	.9999 9343	.9999 8714	.9999 7647
3.55	.9999 9913	.9999 9794	.9999 9558	.9999 9131	.9999 8403
3.60	.9999 9943	.9999 9863	.9999 9704	.9999 9416	.9999 8923
3.65	.9999 9962	.9999 9909	.9999 9803	.9999 9610	.9999 9278
3.70	.9999 9975	.9999 9940	.9999 9870	.9999 9741	.9999 9518
3.75	.9999 9984	.9999 9961	.9999 9914	.9999 9829	.9999 9681
3.80	.9999 9989	.9999 9974	.9999 9944	.9999 9888	.9999 9790
3.85	.9999 9993	.9999 9983	.9999 9964	.9999 9927	.9999 9862
3.90	.9999 9996	.9999 9989	.9999 9976	.9999 9952	.9999 9910
3.95	.9999 9997	.9999 9993	.9999 9985	.9999 9969	.9999 9942
4.00	.9999 9998	.9999 9996	.9999 9990	.9999 9980	.9999 9963
4.05	.9999 9999	.9999 9997	.9999 9994	.9999 9987	.9999 9976
4.10	.9999 9999	.9999 9998	.9999 9996	.9999 9992	.9999 9985
4.15	1.0000 0000	.9999 9999	.9999 9998	.9999 9995	.9999 9990
4.20		.9999 9999	.9999 9998	.9999 9997	.9999 9994
4.25		1.0000 0000	.9999 9999	.9999 9998	.9999 9996
4.30			.9999 9999	.9999 9999	.9999 9998
4.35			1.0000 0000	.9999 9999	.9999 9999
4.40				1.0000 0000	.9999 9999
4.45					.9999 9999
4.50					1.0000 0000
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_3	$P(W_3 \cdot 17)$	$P(W_3 \cdot 18)$	$P(W_3 \cdot 19)$	$P(W_3 \cdot 20)$	$P(W_3 \cdot 22)$
0.05					
0.10					
0.15	.0000 0000	.0000 0000			
0.20	.0000 0007	.0000 0001	.0000 0000		
0.25	.0000 0059	.0000 0009	.0000 0001	.0000 0000	
0.30	.0000 0319	.0000 0060	.0000 0011	.0000 0002	
0.35	.0000 1298	.0000 0284	.0000 0060	.0000 0012	.0000 0000
0.40	.0000 4281	.0000 1065	.0000 0257	.0000 0061	.0000 0003
0.45	.0001 2009	.0000 3352	.0000 0909	.0000 0240	.0000 0016
0.50	.0002 9631	.0000 9158	.0000 2749	.0000 0805	.0000 0065
0.55	.0006 5850	.0002 2304	.0000 7340	.0000 2355	.0000 0227
0.60	.0013 4142	.0004 9364	.0001 7655	.0000 6157	.0000 0702
0.65	.0025 3850	.0010 0763	.0003 8882	.0001 4635	.0000 1945
0.70	.0045 0938	.0019 1868	.0007 9386	.0003 2046	.0000 4901
0.75	.0075 8182	.0034 3921	.0015 1755	.0006 5347	.0001 1380
0.80	.0121 4650	.0058 4603	.0027 3792	.0012 5170	.0002 4584
0.85	.0186 4385	.0094 8037	.0046 9274	.0022 6817	.0004 9825
0.90	.0275 4308	.0147 4106	.0076 8296	.0039 1121	.0009 5378
0.95	.0393 1475	.0220 7008	.0120 7033	.0064 5001	.0017 3434
1.00	.0543 9905	.0319 3093	.0182 6812	.0102 1539	.0030 1030
1.05	.0731 7267	.0447 8105	.0267 2448	.0155 9429	.0050 0813
1.10	.0959 1730	.0610 4046	.0378 9909	.0230 1728	.0080 1474
1.15	.1227 9297	.0810 5943	.0522 3452	.0329 3898	.0123 7694
1.20	.1538 1874	.1050 8825	.0701 2470	.0458 1231	.0184 9448
1.25	.1888 6247	.1332 5199	.0918 8322	.0620 5843	.0268 0621
1.30	.2276 4076	.1655 3279	.1177 1450	.0820 3483	.0377 6923
1.35	.2697 2884	.2017 6146	.1476 9086	.1060 0457	.0518 3204
1.40	.3145 7944	.2416 1905	.1817 3750	.1341 0963	.0694 0381
1.45	.3615 4892	.2846 4839	.2196 2725	.1663 5109	.0908 2200
1.50	.4099 2837	.3302 7446	.2609 8539	.2025 7823	.1163 2166
1.55	.4589 7706	.3778 3168	.3053 0432	.2424 8775	.1460 0941
1.60	.5079 5597	.4265 9597	.3519 6664	.2856 3317	.1798 4473
1.65	.5561 5881	.4758 1876	.4002 7469	.3314 4377	.2176 3075
1.70	.6029 3894	.5247 6062	.4494 8400	.3792 5135	.2590 1557
1.75	.6477 3069	.5727 2212	.4988 3808	.4283 2245	.3035 0424
1.80	.6900 6449	.6190 7009	.5476 0195	.4778 9341	.3504 8038
1.85	.7295 7538	.6632 5810	.5950 9211	.5272 0558	.3992 3549
1.90	.7660 0553	.7048 4027	.6407 0137	.5755 3814	.4490 0365
1.95	.7992 0111	.7434 7861	.6839 1736	.6222 3639	.4989 9841
2.00	.8291 0474	.7789 4401	.7243 3409	.6667 3408	.5484 4933
2.05	.8557 4454	.8111 1179	.7616 5692	.7085 6883	.5966 3526
2.10	.8792 2091	.8399 5288	.7957 0117	.7473 9051	.6429 1238
2.15	.8996 9216	.8655 2175	.8263 8559	.7829 6282	.6867 3558
2.20	.9173 6005	.8879 4237	.8537 2171	.8151 5892	.7276 7226
2.25	.9324 5595	.9073 9319	.8778 0032	.8439 5222	.7654 0867
2.30	.9452 2815	.9240 9234	.8987 7645	.8694 0363	.7997 4913
2.35	.9559 3103	.9382 8366	.9168 5379	.8916 4652	.8306 0934
2.40	.9648 1591	.9502 2413	.9322 6969	.9108 7082	.8580 0489
2.45	.9721 2397	.9601 7325	.9452 8134	.9273 0708	.8820 3650
2.50	.9780 8104	.9683 8436	.9561 5368	.9412 1161	.9028 7346

W_3	$P(W_3, .17)$	$P(W_3, .18)$	$P(W_3, .19)$	$P(W_3, .20)$	$P(W_3, .22)$
2.55	.9828 9407	.9750 9797	.9651 4936	.9528 5322	.9207 3645
2.60	.9867 4913	.9805 3709	.9725 2083	.9625 0194	.9358 8101
2.65	.9898 1066	.9849 0421	.9785 0449	.9704 2001	.9485 8238
2.70	.9922 2169	.9883 7979	.9833 1681	.9768 5503	.9591 2235
2.75	.9941 0487	.9911 2197	.9871 5204	.9820 3521	.9677 7844
2.80	.9955 6388	.9932 6716	.9901 8141	.9861 6649	.9748 1552
2.85	.9966 8529	.9949 3134	.9925 5336	.9894 3121	.9804 7976
2.90	.9975 4047	.9962 1179	.9943 9464	.9919 8804	.9849 9474
2.95	.9981 8760	.9971 8903	.9958 1192	.9939 7287	.9885 5938
3.00	.9986 7359	.9979 2896	.9968 9380	.9955 0035	.9913 4746
3.05	.9990 3582	.9984 8481	.9977 1292	.9966 6590	.9935 0817
3.10	.9993 0382	.9988 9916	.9983 2811	.9975 4784	.9951 6762
3.15	.9995 0066	.9992 0570	.9987 8651	.9982 0970	.9964 3084
3.20	.9996 4420	.9994 3077	.9991 2541	.9987 0239	.9973 8409
3.25	.9997 4813	.9995 9481	.9993 7404	.9990 6623	.9980 9730
3.30	.9998 2285	.9997 1350	.9995 5507	.9993 3282	.9986 2644
3.35	.9998 7620	.9997 9876	.9996 8590	.9995 2663	.9990 1577
3.40	.9999 1403	.9998 5957	.9997 7975	.9996 6648	.9992 9991
3.45	.9999 4067	.9999 0264	.9998 4659	.9997 6662	.9995 0563
3.50	.9999 5931	.9999 3293	.9998 9385	.9998 3780	.9996 5339
3.55	.9999 7227	.9999 5409	.9999 2703	.9998 8803	.9997 5871
3.60	.9999 8122	.9999 6877	.9999 5016	.9999 2321	.9998 3320
3.65	.9999 8735	.9999 7889	.9999 6618	.9999 4769	.9998 8549
3.70	.9999 9154	.9999 8582	.9999 7720	.9999 6460	.9999 2193
3.75	.9999 9437	.9999 9053	.9999 8472	.9999 7619	.9999 4713
3.80	.9999 9628	.9999 9372	.9999 8983	.9999 8409	.9999 6443
3.85	.9999 9755	.9999 9586	.9999 9327	.9999 8944	.9999 7623
3.90	.9999 9840	.9999 9728	.9999 9557	.9999 9303	.9999 8422
3.95	.9999 9896	.9999 9823	.9999 9710	.9999 9543	.9999 8959
4.00	.9999 9933	.9999 9885	.9999 9812	.9999 9702	.9999 9318
4.05	.9999 9957	.9999 9926	.9999 9878	.9999 9807	.9999 9556
4.10	.9999 9972	.9999 9953	.9999 9922	.9999 9876	.9999 9713
4.15	.9999 9982	.9999 9970	.9999 9950	.9999 9921	.9999 9815
4.20	.9999 9989	.9999 9981	.9999 9968	.9999 9949	.9999 9882
4.25	.9999 9993	.9999 9988	.9999 9980	.9999 9968	.9999 9925
4.30	.9999 9996	.9999 9992	.9999 9987	.9999 9980	.9999 9953
4.35	.9999 9997	.9999 9995	.9999 9992	.9999 9987	.9999 9970
4.40	.9999 9998	.9999 9997	.9999 9995	.9999 9992	.9999 9981
4.45	.9999 9999	.9999 9998	.9999 9997	.9999 9995	.9999 9988
4.50	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9993
4.55	1.0000 0000	.9999 9999	.9999 9999	.9999 9998	.9999 9996
4.60		1.0000 0000	.9999 9999	.9999 9999	.9999 9997
4.65			1.0000 0000	.9999 9999	.9999 9998
4.70				1.0000 0000	.9999 9999
4.75					.9999 9999
4.80					1.0000 0000
4.85					
4.90					
4.95					
5.00					

W_3	$P(W_3, .24)$	$P(W_3, .26)$	$P(W_3, .28)$	$P(W_3, .30)$	$P(W_3, .32)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40	.0000 0000				
0.45	.0000 0001				
0.50	.0000 0005	.0000 0000			
0.55	.0000 0020	.0000 0002	.0000 0000		
0.60	.0000 0075	.0000 0007	.0000 0001		
0.65	.0000 0241	.0000 0028	.0000 0003	.0000 0000	
0.70	.0000 0699	.0000 0094	.0000 0012	.0000 0001	.0000 0000
0.75	.0000 1847	.0000 0283	.0000 0041	.0000 0006	.0000 0001
0.80	.0000 4504	.0000 0779	.0000 0129	.0000 0020	.0000 0003
0.85	.0001 0216	.0000 1979	.0000 0366	.0000 0065	.0000 0011
0.90	.0002 1724	.0000 4677	.0000 0960	.0000 0189	.0000 0036
0.95	.0004 3587	.0001 0359	.0000 2349	.0000 0512	.0000 0108
1.00	.0008 2974	.0002 1639	.0000 5387	.0000 1289	.0000 0298
1.05	.0015 0558	.0004 2849	.0001 1645	.0000 3043	.0000 0769
1.10	.0026 1465	.0008 0798	.0002 3853	.0000 6772	.0000 1859
1.15	.0043 6112	.0014 5652	.0004 6492	.0001 4277	.0000 4240
1.20	.0070 0816	.0025 1877	.0008 6562	.0002 8629	.0000 9160
1.25	.0108 7978	.0041 9118	.0015 4463	.0005 4805	.0001 8816
1.30	.0163 5706	.0067 2875	.0026 4955	.0010 0483	.0003 6885
1.35	.0238 6756	.0104 4798	.0043 8043	.0017 6958	.0006 9216
1.40	.0338 6757	.0157 2444	.0069 9676	.0030 0114	.0012 4684
1.45	.0468 1762	.0229 8367	.0108 2052	.0049 1312	.0021 6153
1.50	.0631 5280	.0326 8467	.0162 3388	.0077 8051	.0036 1461
1.55	.0832 5002	.0452 9630	.0236 6992	.0119 4213	.0058 4277
1.60	.1073 9534	.0612 6784	.0335 9589	.0177 9717	.0091 4672
1.65	.1357 5447	.0809 9572	.0464 8904	.0257 9459	.0138 9208
1.70	.1683 4955	.1047 8951	.0628 0623	.0364 1449	.0205 0370
1.75	.2050 4482	.1328 4041	.0829 4963	.0501 4206	.0294 5223
1.80	.2455 4290	.1651 9556	.1072 3143	.0674 3528	.0412 3241
1.85	.2893 9232	.2017 4116	.1358 4120	.0886 8895	.0563 3387
1.90	.3360 0579	.2421 9637	.1688 1931	.1141 9832	.0752 0615
1.95	.3846 8763	.2861 1905	.2060 3948	.1441 2604	.0982 2082
2.00	.4346 6810	.3329 2289	.2472 0282	.1784 7617	.1256 3449
2.05	.4851 4150	.3819 0484	.2918 4418	.2170 7823	.1575 5648
2.10	.5353 0500	.4322 8001	.3393 5068	.2595 8364	.1939 2514
2.15	.5843 9531	.4832 2135	.3889 9079	.3054 7523	.2344 9568
2.20	.6317 2044	.5339 0052	.4399 5146	.3540 8925	.2788 4133
2.25	.6766 8489	.5835 2686	.4913 7983	.4046 4813	.3263 6835
2.30	.7188 0698	.6313 8144	.5424 2616	.4563 0078	.3763 4356
2.35	.7577 2812	.6768 4435	.5922 8431	.5081 6706	.4279 3211
2.40	.7932 1419	.7194 1364	.6402 2690	.5593 8233	.4802 4181
2.45	.8251 5021	.7587 1559	.6856 3294	.6091 3872	.5323 7020
2.50	.8535 2934	.7945 0666	.7280 0659	.6567 1991	.5834 5011

W_3	$P(W_3 \cdot 24)$	$P(W_3 \cdot 26)$	$P(W_3 \cdot 28)$	$P(W_3 \cdot 30)$	$P(W_3 \cdot 32)$
2.55	.8784 3807	.8266 6800	.7669 8658	.7015 2737	.6326 9027
2.60	.9000 3881	.8551 9400	.8023 4697	.7430 9704	.6794 0802
2.65	.9185 5176	.8801 7650	.8339 9006	.7811 0616	.7230 5231
2.70	.9342 3703	.9017 8646	.8619 3338	.8153 7109	.7632 1636
2.75	.9473 7810	.9202 5462	.8862 9225	.8458 3748	.7996 4016
2.80	.9582 6743	.9358 5258	.9072 6010	.8725 6462	.8322 0404
2.85	.9671 9444	.9488 7536	.9250 8796	.8957 0599	.8609 1507
2.90	.9744 3624	.9596 2625	.9400 6476	.9154 8797	.8858 8831
2.95	.9802 5079	.9684 0428	.9524 9940	.9321 8839	.9073 2514
3.00	.9848 7256	.9754 9461	.9627 0546	.9461 1643	.9254 9053
3.05	.9885 1010	.9811 6157	.9709 8877	.9575 9478	.9406 9118
3.10	.9913 4543	.9856 4433	.9776 3811	.9669 4483	.9532 5560
3.15	.9935 3456	.9891 5462	.9829 1870	.9744 7505	.9635 1704
3.20	.9952 0909	.9918 7626	.9870 6841	.9804 7253	.9717 9991
3.25	.9964 7833	.9939 6602	.9902 9597	.9851 9754	.9784 0949
3.30	.9974 3176	.9955 5537	.9927 8111	.9888 8061	.9836 2502
3.35	.9981 4169	.9967 5288	.9946 7575	.9917 2173	.9876 9566
3.40	.9986 6573	.9976 4690	.9961 0628	.9938 9110	.9908 3883
3.45	.9990 4928	.9983 0837	.9971 7616	.9955 3106	.9932 4051
3.50	.9993 2767	.9987 9347	.9979 6889	.9967 5872	.9950 5685
3.55	.9995 2807	.9991 4614	.9985 5091	.9976 6895	.9964 1677
3.60	.9996 7116	.9994 0035	.9989 7441	.9983 3750	.9974 2496
3.65	.9997 7253	.9995 8207	.9992 7987	.9988 2403	.9981 6521
3.70	.9998 4377	.9997 1089	.9994 9828	.9991 7489	.9987 0362
3.75	.9998 9346	.9998 0148	.9996 5313	.9994 2568	.9990 9159
3.80	.9999 2785	.9998 6468	.9997 6200	.9996 0338	.9993 6863
3.85	.9999 5148	.9999 0842	.9998 3792	.9997 2822	.9995 6470
3.90	.9999 6759	.9999 3846	.9998 9043	.9998 1519	.9997 0225
3.95	.9999 7850	.9999 5894	.9999 2647	.9998 7527	.9997 9792
4.00	.9999 8583	.9999 7279	.9999 5101	.9999 1645	.9998 6390
4.05	.9999 9073	.9999 8209	.9999 6759	.9999 4444	.9999 0903
4.10	.9999 9397	.9999 8829	.9999 7871	.9999 6332	.9999 3965
4.15	.9999 9610	.9999 9240	.9999 8611	.9999 7596	.9999 6026
4.20	.9999 9750	.9999 9510	.9999 9100	.9999 8435	.9999 7402
4.25	.9999 9840	.9999 9686	.9999 9421	.9999 8989	.9999 8314
4.30	.9999 9899	.9999 9800	.9999 9630	.9999 9351	.9999 8913
4.35	.9999 9936	.9999 9873	.9999 9765	.9999 9586	.9999 9304
4.40	.9999 9960	.9999 9920	.9999 9852	.9999 9738	.9999 9558
4.45	.9999 9975	.9999 9950	.9999 9907	.9999 9835	.9999 9721
4.50	.9999 9985	.9999 9969	.9999 9942	.9999 9897	.9999 9825
4.55	.9999 9991	.9999 9981	.9999 9964	.9999 9936	.9999 9891
4.60	.9999 9994	.9999 9988	.9999 9978	.9999 9961	.9999 9933
4.65	.9999 9996	.9999 9993	.9999 9987	.9999 9976	.9999 9959
4.70	.9999 9998	.9999 9996	.9999 9992	.9999 9985	.9999 9975
4.75	.9999 9999	.9999 9997	.9999 9995	.9999 9991	.9999 9985
4.80	.9999 9999	.9999 9998	.9999 9997	.9999 9995	.9999 9991
4.85	1.0000 0000	.9999 9999	.9999 9998	.9999 9997	.9999 9994
4.90		.9999 9999	.9999 9999	.9999 9998	.9999 9997
4.95		1.0000 0000	.9999 9999	.9999 9999	.9999 9998
5.00			1.0000 0000	.9999 9999	.9999 9999

W_3	$P(W_3 \cdot 24)$	$P(W_3 \cdot 26)$	$P(W_3 \cdot 28)$	$P(W_3 \cdot 30)$	$P(W_3 \cdot 32)$
5.05				1.0000 0000	.9999 9999
5.10					1.0000 0000
5.15					
5.20					
5.25					
5.30					
5.35					
5.40					
5.45					
5.50					
5.55					
5.60					
5.65					
5.70					
5.75					
5.80					
5.85					
5.90					
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_3	$P(W_3, .34)$	$P(W_3, .36)$	$P(W_3, .38)$	$P(W_3, .40)$	$P(W_3, .50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80	.0000 0000				
0.85	.0000 0002	.0000 0000			
0.90	.0000 0007	.0000 0001	.0000 0000		
0.95	.0000 0022	.0000 0004	.0000 0001	.0000 0000	
1.00	.0000 0067	.0000 0015	.0000 0003	.0000 0001	
1.05	.0000 0188	.0000 0045	.0000 0011	.0000 0002	
1.10	.0000 0496	.0000 0129	.0000 0033	.0000 0008	
1.15	.0000 1223	.0000 0344	.0000 0094	.0000 0025	
1.20	.0000 2847	.0000 0863	.0000 0255	.0000 0074	
1.25	.0000 6277	.0000 2042	.0000 0649	.0000 0202	.0000 0000
1.30	.0001 3159	.0000 4578	.0000 1558	.0000 0519	.0000 0002
1.35	.0002 6319	.0000 9761	.0000 3541	.0000 1259	.0000 0006
1.40	.0005 0370	.0001 9851	.0000 7653	.0000 2893	.0000 0018
1.45	.0009 2497	.0003 8623	.0001 5779	.0000 6321	.0000 0052
1.50	.0016 3384	.0007 2079	.0003 1118	.0001 3176	.0000 0142
1.55	.0027 8222	.0012 9339	.0005 8852	.0002 6268	.0000 0369
1.60	.0045 7687	.0022 3644	.0010 6987	.0005 0214	.0000 0910
1.65	.0072 8715	.0037 3390	.0018 7350	.0009 2246	.0000 2127
1.70	.0112 4909	.0060 3051	.0031 6656	.0016 3198	.0000 4738
1.75	.0168 6353	.0094 3796	.0051 7514	.0027 8584	.0001 0077
1.80	.0245 8698	.0143 3604	.0081 9209	.0045 9676	.0002 0509
1.85	.0349 1398	.0211 6684	.0125 8027	.0073 4389	.0004 0032
1.90	.0483 5108	.0304 2058	.0187 6946	.0113 7776	.0007 5084
1.95	.0653 8361	.0426 1252	.0272 4486	.0171 1904	.0013 5575
2.00	.0864 3769	.0582 5166	.0385 2652	.0250 4925	.0023 6073
2.05	.1118 4082	.0778 0317	.0531 3977	.0356 9205	.0039 7062
2.10	.1417 8521	.1016 4768	.0715 7823	.0495 8498	.0064 6076
2.15	.1762 9806	.1300 4155	.0942 6232	.0672 4303	.0101 8485
2.20	.2152 2230	.1630 8245	.1214 9730	.0891 1649	.0155 7663
2.25	.2582 1065	.2006 8459	.1534 3531	.1155 4726	.0231 4276
2.30	.3047 3403	.2425 6669	.1900 4613	.1467 2813	.0334 4497
2.35	.3541 0409	.2882 5484	.2311 0032	.1826 7000	.0470 7067
2.40	.4055 0781	.3371 0043	.2761 6751	.2231 8129	.0645 9304
2.45	.4580 5100	.3883 1178	.3246 3054	.2678 6269	.0865 2323
2.50	.5108 0667	.4409 9648	.3757 1454	.3161 1837	.1132 5929

W_3	$P(W_3, .34)$	$P(W_3, .36)$	$P(W_3, .38)$	$P(W_3, .40)$	$P(W_3, .50)$
2.55	.5628 6377	.4942 1048	.4285 2827	.3671 8324	.1450 3741
2.60	.6133 7242	.5470 0924	.4821 1375	.4201 6377	.1818 9166
2.65	.6615 8193	.5984 9664	.5354 9941	.4740 8817	.2236 2773
2.70	.7068 6937	.6478 6739	.5877 5193	.5279 6141	.2698 1490
2.75	.7487 5731	.6944 4029	.6380 2240	.5808 1958	.3197 9807
2.80	.7869 2064	.7376 8025	.6855 8328	.6317 7906	.3727 2934
2.85	.8211 8335	.7772 0889	.7298 5410	.6800 7658	.4276 1618
2.90	.8515 0690	.8128 0405	.7704 1495	.7250 9765	.4833 8113
2.95	.8779 7238	.8443 8995	.8070 0827	.7663 9232	.5389 2679
3.00	.9007 5862	.8720 2008	.8395 3032	.8036 7845	.5931 9975
3.05	.9201 1859	.8958 5521	.8680 1455	.8368 3406	.6452 4731
3.10	.9363 5597	.9161 3895	.8926 0941	.8658 8074	.6942 6248
3.15	.9498 0346	.9331 7312	.9135 5313	.8909 6107	.7396 1436
3.20	.9608 0392	.9472 9446	.9311 4790	.9123 1259	.7808 6284
3.25	.9696 9491	.9588 5421	.9457 3534	.9302 4083	.8177 5837
3.30	.9767 9687	.9682 0113	.9576 7467	.9450 9368	.8502 2903
3.35	.9824 0494	.9756 6840	.9673 2453	.9572 3845	.8783 5779
3.40	.9867 8384	.9815 6429	.9750 2883	.9670 4273	.9023 5368
3.45	.9901 6561	.9861 6630	.9811 0655	.9748 5942	.9225 2005
3.50	.9927 4938	.9897 1828	.9858 4531	.9810 1602	.9392 2306
3.55	.9947 0279	.9924 2987	.9894 9810	.9858 0776	.9528 6275
3.60	.9961 6450	.9944 7781	.9922 8248	.9894 9416	.9638 4816
3.65	.9972 4731	.9960 0837	.9943 8186	.9922 9820	.9725 7757
3.70	.9980 4156	.9971 4055	.9959 4794	.9944 0756	.9794 2395
3.75	.9986 1853	.9979 6967	.9971 0405	.9959 7725	.9847 2530
3.80	.9990 3372	.9985 7090	.9979 4884	.9971 3303	.9887 7948
3.85	.9993 2973	.9990 0269	.9985 5999	.9979 7527	.9918 4247
3.90	.9995 3885	.9993 0987	.9989 9781	.9985 8283	.9941 2934
3.95	.9996 8528	.9995 2640	.9993 0846	.9990 1679	.9958 1712
4.00	.9997 8691	.9996 7764	.9995 2683	.9993 2375	.9970 4880
4.05	.9998 5685	.9997 8235	.9996 7892	.9995 3883	.9979 3778
4.10	.9999 0457	.9998 5420	.9997 8389	.9996 8813	.9985 7256
4.15	.9999 3686	.9999 0310	.9998 5571	.9997 9083	.9990 2109
4.20	.9999 5854	.9999 3609	.9999 0442	.9998 6084	.9993 3479
4.25	.9999 7298	.9999 5817	.9999 3718	.9999 0816	.9995 5199
4.30	.9999 8251	.9999 7282	.9999 5902	.9999 3986	.9997 0092
4.35	.9999 8877	.9999 8247	.9999 7347	.9999 6092	.9998 0206
4.40	.9999 9283	.9999 8878	.9999 8296	.9999 7480	.9998 7010
4.45	.9999 9546	.9999 9287	.9999 8913	.9999 8387	.9999 1546
4.50	.9999 9714	.9999 9550	.9999 9312	.9999 8975	.9999 4543
4.55	.9999 9821	.9999 9718	.9999 9567	.9999 9354	.9999 6506
4.60	.9999 9889	.9999 9824	.9999 9730	.9999 9595	.9999 7780
4.65	.9999 9932	.9999 9891	.9999 9832	.9999 9748	.9999 8601
4.70	.9999 9958	.9999 9933	.9999 9897	.9999 9845	.9999 9125
4.75	.9999 9975	.9999 9959	.9999 9937	.9999 9905	.9999 9457
4.80	.9999 9985	.9999 9975	.9999 9962	.9999 9942	.9999 9665
4.85	.9999 9991	.9999 9985	.9999 9977	.9999 9965	.9999 9795
4.90	.9999 9994	.9999 9991	.9999 9986	.9999 9979	.9999 9876
4.95	.9999 9997	.9999 9995	.9999 9992	.9999 9987	.9999 9925
5.00	.9999 9998	.9999 9997	.9999 9995	.9999 9993	.9999 9955

W_3	$P(W_3 \cdot 34)$	$P(W_3 \cdot 36)$	$P(W_3 \cdot 38)$	$P(W_3 \cdot 40)$	$P(W_3 \cdot 50)$
5.05	.9999 9999	.9999 9998	.9999 9997	.9999 9996	.9999 9973
5.10	.9999 9999	.9999 9999	.9999 9998	.9999 9997	.9999 9984
5.15	1.0000 0000	.9999 9999	.9999 9999	.9999 9998	.9999 9991
5.20		1.0000 0000	.9999 9999	.9999 9999	.9999 9995
5.25			1.0000 0000	.9999 9999	.9999 9997
5.30				1.0000 0000	.9999 9998
5.35					.9999 9999
5.40					.9999 9999
5.45					1.0000 0000
5.50					
5.55					
5.60					
5.65					
5.70					
5.75					
5.80					
5.85					
5.90					
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_3	$P(W_3 \cdot 60)$	$P(W_3 \cdot 70)$	$P(W_3 \cdot 80)$	$P(W_3 \cdot 90)$	$P(W_3 \cdot 100)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20					
1.25					
1.30					
1.35					
1.40					
1.45	.0000 0000				
1.50	.0000 0001				
1.55	.0000 0004				
1.60	.0000 0012	.0000 0000			
1.65	.0000 0037	.0000 0001			
1.70	.0000 0104	.0000 0002			
1.75	.0000 0277	.0000 0006			
1.80	.0000 0697	.0000 0020	.0000 0000		
1.85	.0000 1666	.0000 0058	.0000 0002		
1.90	.0000 3793	.0000 0159	.0000 0006	.0000 0000	
1.95	.0000 8242	.0000 0417	.0000 0018	.0000 0001	
2.00	.0001 7129	.0000 1035	.0000 0055	.0000 0003	
2.05	.0003 4116	.0000 2445	.0000 0153	.0000 0009	.0000 0000
2.10	.0006 5237	.0000 5503	.0000 0406	.0000 0027	.0000 0002
2.15	.0011 9984	.0001 1829	.0000 1022	.0000 0080	.0000 0006
2.20	.0021 2596	.0002 4330	.0000 2443	.0000 0222	.0000 0019
2.25	.0036 3471	.0004 7967	.0000 5559	.0000 0583	.0000 0056
2.30	.0060 0507	.0009 0805	.0001 2074	.0000 1454	.0000 0162
2.35	.0096 0112	.0016 5333	.0002 5070	.0000 3444	.0000 0437
2.40	.0148 7569	.0028 9988	.0004 9852	.0000 7772	.0000 1121
2.45	.0223 6437	.0049 0713	.0009 5103	.0001 6731	.0000 2724
2.50	.0326 6742	.0080 2294	.0017 4340	.0003 4426	.0000 6296

W_3	$P(W_3, .60)$	$P(W_3, .70)$	$P(W_3, .80)$	$P(W_3, .90)$	$P(W_3, .100)$
2.55	.0464 1816	.0126 9136	.0030 7598	.0006 7823	.0001 3861
2.60	.0642 3886	.0194 5091	.0052 3133	.0012 8156	.0002 9122
2.65	.0866 8689	.0289 2006	.0085 8856	.0023 2634	.0005 8501
2.70	.1141 9653	.0417 6779	.0136 3096	.0040 6321	.0011 2553
2.75	.1470 2311	.0586 6902	.0209 4258	.0068 3891	.0020 7744
2.80	.1851 9686	.0802 4753	.0311 9000	.0111 0882	.0036 8453
2.85	.2284 9325	.1070 1166	.0450 8717	.0174 3960	.0062 8927
2.90	.2764 2476	.1392 9015	.0633 4347	.0264 9732	.0103 4768
2.95	.3282 5635	.1771 7676	.0865 9869	.0390 1752	.0164 3452
3.00	.3830 4381	.2204 9189	.1153 5139	.0557 5631	.0252 3320
3.05	.4396 9090	.2687 6775	.1498 8963	.0774 2473	.0375 0652
3.10	.4970 1933	.3212 6042	.1902 3393	.1046 1253	.0540 4644
3.15	.5538 4356	.3769 8854	.2361 0168	.1377 1042	.0756 0509
3.20	.6090 4282	.4347 9473	.2868 9948	.1768 4198	.1028 1322
3.25	.6616 2334	.4934 2261	.3417 4614	.2218 1579	.1360 9604
3.30	.7107 6556	.5516 0062	.3995 2467	.2721 0671	.1755 9860
3.35	.7558 5356	.6081 2333	.4589 5731	.3268 7064	.2211 3288
3.40	.7964 8600	.6619 2196	.5186 9463	.3849 9251	.2721 5632
3.45	.8324 7023	.7121 1792	.5774 0805	.4451 6208	.3277 8705
3.50	.8638 0256	.7580 5591	.6338 7553	.5059 6818	.3868 5556
3.55	.8906 3879	.7993 1582	.6870 5171	.5659 9969	.4479 8682
3.60	.9132 5906	.8357 0538	.7361 1674	.6239 4141	.5097 0231
3.65	.9320 3125	.8672 3719	.7805 0137	.6786 5446	.5705 2898
3.70	.9473 7597	.8940 9481	.8198 8892	.7292 3400	.6291 0189
3.75	.9597 3572	.9165 9305	.8541 9750	.7750 4089	.6842 4934
3.80	.9695 4962	.9351 3693	.8835 4741	.8157 0731	.7350 5269
3.85	.9772 3425	.9501 8308	.9082 1952	.8511 2000	.7808 7733
3.90	.9831 7053	.9622 0618	.9286 1004	.8813 8629	.8213 7568
3.95	.9876 9611	.9716 7212	.9451 8649	.9067 8941	.8564 6614
4.00	.9911 0219	.9790 1804	.9584 4847	.9277 3944	.8862 9430
4.05	.9936 3381	.9846 3941	.9688 9526	.9447 2523	.9111 8360
4.10	.9954 9269	.9888 8284	.9770 0139	.9582 7139	.9315 8227
4.15	.9968 4147	.9920 4395	.9831 9993	.9689 0288	.9480 1232
4.20	.9978 0889	.9943 6861	.9878 7292	.9771 1829	.9610 2483
4.25	.9984 9497	.9960 5687	.9913 4755	.9833 7180	.9711 6384
4.30	.9989 7622	.9972 6806	.9938 9673	.9880 6292	.9789 3997
4.35	.9993 1019	.9981 2674	.9957 4274	.9915 3245	.9848 1321
4.40	.9995 3953	.9987 2851	.9970 6273	.9940 6345	.9891 8380
4.45	.9996 9542	.9991 4550	.9979 9504	.9958 8531	.9923 8971
4.50	.9998 0034	.9994 3131	.9986 4570	.9971 7982	.9947 0869
4.55	.9998 7026	.9996 2511	.9990 9453	.9980 8812	.9963 6356
4.60	.9999 1642	.9997 5517	.9994 0066	.9987 1768	.9975 2909
4.65	.9999 4661	.9998 4156	.9996 0717	.9991 4889	.9983 3957
4.70	.9999 6618	.9998 9839	.9997 4498	.9994 4084	.9988 9624
4.75	.9999 7875	.9999 3540	.9998 3599	.9996 3630	.9992 7400
4.80	.9999 8675	.9999 5928	.9998 9549	.9997 6573	.9995 2739
4.85	.9999 9181	.9999 7455	.9999 3400	.9998 5054	.9996 9543
4.90	.9999 9497	.9999 8423	.9999 5869	.9999 0553	.9998 0565
4.95	.9999 9694	.9999 9030	.9999 7436	.9999 4083	.9998 7717
5.00	.9999 9815	.9999 9408	.9999 8422	.9999 6327	.9999 2310

W_3	$P(W_3, .60)$	$P(W_3, .70)$	$P(W_3, .80)$	$P(W_3, .90)$	$P(W_3, .100)$
5.05	.9999 9889	.9999 9642	.9999 9037	.9999 7740	.9999 5229
5.10	.9999 9934	.9999 9785	.9999 9417	.9999 8621	.9999 7067
5.15	.9999 9961	.9999 9872	.9999 9650	.9999 9166	.9999 8213
5.20	.9999 9977	.9999 9924	.9999 9791	.9999 9499	.9999 8920
5.25	.9999 9987	.9999 9955	.9999 9877	.9999 9702	.9999 9353
5.30	.9999 9992	.9999 9974	.9999 9928	.9999 9824	.9999 9616
5.35	.9999 9996	.9999 9985	.9999 9958	.9999 9897	.9999 9773
5.40	.9999 9997	.9999 9991	.9999 9976	.9999 9940	.9999 9867
5.45	.9999 9999	.9999 9995	.9999 9986	.9999 9965	.9999 9923
5.50	.9999 9999	.9999 9997	.9999 9992	.9999 9980	.9999 9956
5.55	1.0000 0000	.9999 9998	.9999 9995	.9999 9989	.9999 9975
5.60		.9999 9999	.9999 9997	.9999 9994	.9999 9986
5.65		1.0000 0000	.9999 9999	.9999 9996	.9999 9992
5.70			.9999 9999	.9999 9998	.9999 9995
5.75			1.0000 0000	.9999 9999	.9999 9997
5.80				.9999 9999	.9999 9999
5.85				1.0000 0000	.9999 9999
5.90					1.0000 0000
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
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7.35					
7.40					
7.45					
7.50					

W_4	$P(W_4,7)$	$P(W_4,8)$	$P(W_4,9)$	$P(W_4,10)$	$P(W_4,11)$
0.05				.1703 6805	.0170 1235
0.10				.3145 3303	.0610 0864
0.15				.4359 8770	.1230 0965
0.20				.5378 5608	.1959 1265
0.25				.6229 1579	.2742 1671
0.30				.6936 2172	.3537 6981
0.35				.7521 3089	.4315 3948
0.40				.8003 2757	.5054 0791
0.45				.8398 4821	.5739 9144
0.50				.8721 0593	.6364 8409
0.55				.8983 1402	.6925 2369
0.60				.9195 0830	.7420 7935
0.65				.9365 6806	.7853 5832
0.70				.9502 3550	.8227 3024
0.75				.9611 3365	.8546 6689
0.80				.9697 8249	.8816 9522
0.85				.9766 1364	.9043 6175
0.90				.9819 8334	.9232 0657
0.95				.9861 8401	.9387 4505
1.00				.9894 5430	.9514 5596
1.05				.9919 8797	.9617 7440
1.10				.9939 4138	.9700 8864
1.15				.9954 4007	.9767 3965
1.20				.9965 8426	.9820 2268
1.25				.9974 5350	.9861 9016
1.30				.9981 1059	.9894 5538
1.35				.9986 0485	.9919 9664
1.40				.9989 7478	.9939 6148
1.45				.9992 5026	.9954 7080
1.50				.9994 5439	.9966 2279
1.55				.9996 0488	.9974 9646
1.60				.9997 1526	.9981 5490
1.65				.9997 9582	.9986 4803
1.70				.9998 5431	.9990 1509
1.75				.9998 9656	.9992 8661
1.80				.9999 2692	.9994 8625
1.85				.9999 4863	.9996 3213
1.90				.9999 6407	.9997 3810
1.95				.9999 7500	.9998 1460
2.00				.9999 8269	.9998 6951
2.05				.9999 8808	.9999 0867
2.10				.9999 9183	.9999 3645
2.15				.9999 9443	.9999 5603
2.20				.9999 9622	.9999 6975
2.25				.9999 9745	.9999 7930
2.30				.9999 9829	.9999 8592
2.35				.9999 9886	.9999 9048
2.40				.9999 9924	.9999 9360
2.45				.9999 9950	.9999 9572
2.50				.9999 9967	.9999 9715

W_4	$P(W_4,7)$	$P(W_4,8)$	$P(W_4,9)$	$P(W_4,10)$	$P(W_4,11)$
2.55				.9999 9978	.9999 9812
2.60				.9999 9986	.9999 9876
2.65				.9999 9991	.9999 9919
2.70				.9999 9994	.9999 9947
2.75				.9999 9996	.9999 9966
2.80				.9999 9998	.9999 9978
2.85				.9999 9998	.9999 9986
2.90				.9999 9999	.9999 9991
2.95				.9999 9999	.9999 9994
3.00				1.0000 0000	.9999 9996
3.05					.9999 9998
3.10					.9999 9999
3.15					.9999 9999
3.20					.9999 9999
3.25					1.0000 0000
3.30					
3.35					
3.40					
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_4	$P(W_4,12)$	$P(W_4,13)$	$P(W_4,14)$	$P(W_4,15)$	$P(W_4,16)$
0.05	.0012 6254	.0000 7703	.0000 0408	.0000 0019	.0000 0001
0.10	.0089 2113	.0010 7875	.0001 1359	.0000 1076	.0000 0094
0.15	.0265 5140	.0047 6869	.0007 4819	.0001 0578	.0000 1376
0.20	.0554 2078	.0131 3046	.0027 2673	.0005 1123	.0000 8832
0.25	.0951 9619	.0278 6852	.0071 7645	.0016 7190	.0003 5938
0.30	.1445 1245	.0501 3764	.0153 5899	.0042 6601	.0010 9476
0.35	.2014 1628	.0804 4039	.0284 7914	.0091 6343	.0027 2814
0.40	.2637 0147	.1186 4138	.0475 1820	.0173 3983	.0058 6399
0.45	.3291 5141	.1640 5502	.0731 1457	.0297 6659	.0112 4992
0.50	.3957 0458	.2155 7334	.1054 9964	.0472 9721	.0197 1947
0.55	.4615 5774	.2718 0788	.1444 8678	.0705 6830	.0321 1417
0.60	.5252 2040	.3312 2758	.1895 0482	.0999 2759	.0491 9695
0.65	.5855 3250	.3922 8063	.2396 6411	.1353 9550	.0715 6953
0.70	.6416 5561	.4534 9353	.2938 4230	.1766 6146	.0996 0490
0.75	.6930 4643	.5135 4477	.3507 7791	.2231 1125	.1334 0260
0.80	.7394 1939	.5713 1321	.4091 6161	.2738 7888	.1727 7093
0.85	.7807 0409	.6259 0366	.4677 1772	.3279 1471	.2172 3619
0.90	.8170 0162	.6766 5308	.5252 7083	.3840 6122	.2660 7594
0.95	.8485 4262	.7231 2160	.5807 9513	.4411 2861	.3183 7077
1.00	.8756 4929	.7650 7248	.6334 4603	.4979 6374	.3730 6789
1.05	.8987 0217	.8024 4494	.6825 7503	.5535 0777	.4290 4950
1.10	.9181 1253	.8353 2336	.7277 3033	.6068 3974	.4851 9928
1.15	.9343 0010	.8639 0544	.7686 4586	.6572 0511	.5404 6183
1.20	.9476 7611	.8884 7175	.8052 2198	.7040 2971	.5938 9116
1.25	.9586 3089	.9093 5785	.8375 0082	.7469 2078	.6446 8600
1.30	.9675 2562	.9269 3019	.8656 3900	.7856 5731	.6922 1124
1.35	.9746 8736	.9415 6603	.8898 7996	.8201 7249	.7360 0626
1.40	.9804 0681	.9536 3764	.9105 2771	.8505 3091	.7757 8173
1.45	.9849 3810	.9635 0041	.9279 2323	.8769 0305	.8114 0705
1.50	.9885 0009	.9714 8466	.9424 2426	.8995 3928	.8428 9111
1.55	.9912 7875	.9778 9042	.9543 8878	.9187 4501	.8703 5890
1.60	.9934 3009	.9829 8495	.9641 6234	.9348 5830	.8940 2626
1.65	.9950 8342	.9870 0206	.9720 6884	.9482 3069	.9141 7477
1.70	.9963 4480	.9901 4313	.9784 0453	.9592 1151	.9311 2836
1.75	.9973 0024	.9925 7906	.9834 3461	.9681 3597	.9452 3267
1.80	.9980 1881	.9944 5292	.9873 9204	.9753 1655	.9568 3765
1.85	.9985 5546	.9958 8296	.9904 7799	.9810 3750	.9662 8397
1.90	.9989 5347	.9969 6579	.9928 6346	.9855 5190	.9738 9282
1.95	.9992 4663	.9977 7939	.9946 9170	.9890 8080	.9799 5901
2.00	.9994 6109	.9983 8605	.9960 8110	.9918 1397	.9847 4697
2.05	.9996 1692	.9988 3503	.9971 2829	.9939 1173	.9884 8904
2.10	.9997 2940	.9991 6483	.9979 1111	.9955 0751	.9913 8560
2.15	.9998 1004	.9994 0532	.9984 9160	.9967 1082	.9936 0656
2.20	.9998 6748	.9995 7940	.9989 1865	.9976 1040	.9952 9372
2.25	.9999 0812	.9997 0451	.9992 3035	.9982 7722	.9965 6371
2.30	.9999 3669	.9997 9379	.9994 5611	.9987 6737	.9975 1112
2.35	.9999 5664	.9998 5704	.9996 1836	.9991 2469	.9982 1164
2.40	.9999 7049	.9999 0155	.9997 3409	.9993 8306	.9987 2510
2.45	.9999 8004	.9999 3264	.9998 1601	.9995 6838	.9990 9823
2.50	.9999 8658	.9999 5421	.9998 7358	.9997 0025	.9993 6708

W_4	$P(W_4, 12)$	$P(W_4, 13)$	$P(W_4, 14)$	$P(W_4, 15)$	$P(W_4, 16)$
2.55	.9999 9103	.9999 6908	.9999 1373	.9997 9334	.9995 5919
2.60	.9999 9404	.9999 7925	.9999 4154	.9998 5855	.9996 9532
2.65	.9999 9607	.9999 8617	.9999 6065	.9999 0388	.9997 9100
2.70	.9999 9742	.9999 9084	.9999 7369	.9999 3515	.9998 5770
2.75	.9999 9832	.9999 9397	.9999 8253	.9999 5656	.9999 0384
2.80	.9999 9891	.9999 9606	.9999 8848	.9999 7110	.9999 3549
2.85	.9999 9930	.9999 9744	.9999 9245	.9999 8091	.9999 5704
2.90	.9999 9955	.9999 9835	.9999 9509	.9999 8748	.9999 7160
2.95	.9999 9971	.9999 9894	.9999 9682	.9999 9184	.9999 8136
3.00	.9999 9982	.9999 9932	.9999 9796	.9999 9472	.9999 8786
3.05	.9999 9989	.9999 9957	.9999 9870	.9999 9661	.9999 9214
3.10	.9999 9993	.9999 9973	.9999 9917	.9999 9784	.9999 9495
3.15	.9999 9996	.9999 9983	.9999 9948	.9999 9863	.9999 9678
3.20	.9999 9997	.9999 9989	.9999 9967	.9999 9914	.9999 9796
3.25	.9999 9998	.9999 9994	.9999 9980	.9999 9946	.9999 9872
3.30	.9999 9999	.9999 9996	.9999 9988	.9999 9966	.9999 9920
3.35	.9999 9999	.9999 9998	.9999 9992	.9999 9979	.9999 9950
3.40	1.0000 0000	.9999 9999	.9999 9995	.9999 9987	.9999 9969
3.45		.9999 9999	.9999 9997	.9999 9992	.9999 9981
3.50		.9999 9999	.9999 9998	.9999 9995	.9999 9989
3.55		1.0000 0000	.9999 9999	.9999 9997	.9999 9993
3.60			.9999 9999	.9999 9998	.9999 9996
3.65			1.0000 0000	.9999 9999	.9999 9998
3.70				.9999 9999	.9999 9999
3.75				1.0000 0000	.9999 9999
3.80					1.0000 0000
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
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4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_4	$P(W_4, .17)$	$P(W_4, .18)$	$P(W_4, .19)$	$P(W_4, .20)$	$P(W_4, .22)$
0.05	.0000 0000	.0000 0000			
0.10	.0000 0008	.0000 0001	.0000 0000		
0.15	.0000 0167	.0000 0019	.0000 0002	.0000 0000	
0.20	.0000 1427	.0000 0218	.0000 0032	.0000 0004	.0000 0000
0.25	.0000 7230	.0000 1376	.0000 0250	.0000 0044	.0000 0001
0.30	.0002 6318	.0000 5989	.0000 1301	.0000 0271	.0000 0011
0.35	.0007 6163	.0002 0142	.0000 5086	.0000 1234	.0000 0066
0.40	.0018 6152	.0005 6020	.0001 6105	.0000 4450	.0000 0308
0.45	.0039 9564	.0013 4637	.0004 3364	.0001 3431	.0000 1167
0.50	.0077 3562	.0028 8139	.0010 2652	.0003 5183	.0000 3748
0.55	.0137 6842	.0056 1010	.0021 8776	.0008 2117	.0001 0502
0.60	.0228 5015	.0100 9623	.0042 7243	.0017 4111	.0002 6277
0.65	.0357 4272	.0169 9870	.0077 4847	.0034 0325	.0005 9732
0.70	.0531 4145	.0270 2931	.0131 8737	.0062 0326	.0012 5042
0.75	.0756 0343	.0408 9591	.0212 3803	.0106 4060	.0024 3655
0.80	.1034 8577	.0592 3764	.0325 8449	.0173 0380	.0044 5805
0.85	.1369 0146	.0825 6039	.0478 9152	.0268 4008	.0077 1364
0.90	.1756 9732	.1111 8046	.0677 4395	.0399 1116	.0126 9696
0.95	.2194 5594	.1451 8349	.0925 8712	.0571 3897	.0199 8201
1.00	.2675 2004	.1844 0311	.1226 7563	.0790 4750	.0301 9475
1.05	.3190 3551	.2284 2155	.1580 3685	.1060 0732	.0439 7171
1.10	.3730 0761	.2765 9134	.1984 5322	.1381 8989	.0619 0913
1.15	.4283 6404	.3280 7504	.2434 6551	.1755 3704	.0845 0766
1.20	.4840 1873	.3818 9818	.2923 9595	.2177 4934	.1121 1912
1.25	.5389 3070	.4370 0955	.3443 8858	.2642 9484	.1449 0158
1.30	.5921 5395	.4923 4291	.3984 6190	.3144 3669	.1827 8856
1.35	.6428 7545	.5468 7473	.4535 6839	.3672 7669	.2254 7621
1.40	.6904 4002	.5996 7361	.5086 5491	.4218 0975	.2724 3028
1.45	.7343 6219	.6499 3843	.5627 1901	.4769 8372	.3229 1208
1.50	.7743 2617	.6970 2370	.6148 5655	.5317 5886	.3760 2080
1.55	.8101 7607	.7404 5201	.6642 9815	.5851 6197	.4307 4730
1.60	.8418 9848	.7799 1469	.7104 3273	.6363 3111	.4860 3411
1.65	.8696 0030	.8152 6232	.7528 1826	.6845 4848	.5408 3570
1.70	.8934 8392	.8464 8777	.7911 8079	.7292 6027	.5941 7372
1.75	.9138 2213	.8737 0392	.8254 0369	.7700 8375	.6451 8307
1.80	.9309 3415	.8971 1892	.8555 0937	.8068 0297	.6931 4585
1.85	.9451 6431	.9170 1081	.8816 3635	.8393 5518	.7375 1202
1.90	.9568 6389	.9337 0342	.9040 1381	.8678 1046	.7779 0668
1.95	.9663 7662	.9475 4482	.9229 3606	.8923 4730	.8141 2561
2.00	.9740 2778	.9588 8900	.9387 3845	.9132 2643	.8461 2087
2.05	.9801 1673	.9680 8132	.9517 7605	.9307 6515	.8739 7949
2.10	.9849 1238	.9754 4763	.9624 0586	.9453 1362	.8978 9780
2.15	.9886 5121	.9812 8679	.9709 7282	.9572 3440	.9181 5409
2.20	.9915 3718	.9858 6640	.9777 9953	.9668 8569	.9350 8182
2.25	.9937 4312	.9894 2086	.9831 7958	.9746 0851	.9490 4519
2.30	.9954 1313	.9921 5157	.9873 7377	.9807 1774	.9604 1796
2.35	.9966 6552	.9942 2846	.9906 0889	.9854 9657	.9695 6656
2.40	.9975 9603	.9957 9256	.9930 7835	.9891 9382	.9768 3720
2.45	.9982 8107	.9969 5911	.9949 4414	.9920 2358	.9825 4717
2.50	.9987 8088	.9978 2089	.9963 3971	.9941 6659	.9869 7961

W_4	$P(W_4,17)$	$P(W_4,18)$	$P(W_4,19)$	$P(W_4,20)$	$P(W_4,22)$
2.55	.9991 4232	.9984 5158	.9973 7329	.9957 7273	.9903 8137
2.60	.9994 0140	.9989 0889	.9981 3137	.9969 6426	.9929 6308
2.65	.9995 8552	.9992 3748	.9986 8207	.9978 3938	.9949 0107
2.70	.9997 1526	.9994 7146	.9990 7838	.9984 7580	.9963 4025
2.75	.9998 0590	.9996 3661	.9993 6093	.9989 3414	.9973 9777
2.80	.9998 6871	.9997 5216	.9995 6055	.9992 6109	.9981 6681
2.85	.9999 1187	.9998 3230	.9997 0031	.9994 9213	.9987 2037
2.90	.9999 4129	.9998 8743	.9997 9729	.9996 5388	.9991 1484
2.95	.9999 6118	.9999 2502	.9998 6400	.9997 6609	.9993 9318
3.00	.9999 7452	.9999 5045	.9999 0948	.9998 4324	.9995 8767
3.05	.9999 8341	.9999 6750	.9999 4023	.9998 9580	.9997 2227
3.10	.9999 8927	.9999 7885	.9999 6085	.9999 3130	.9998 1455
3.15	.9999 9311	.9999 8634	.9999 7455	.9999 5507	.9998 7723
3.20	.9999 9561	.9999 9124	.9999 8359	.9999 7085	.9999 1941
3.25	.9999 9722	.9999 9443	.9999 8950	.9999 8124	.9999 4754
3.30	.9999 9826	.9999 9648	.9999 9333	.9999 8802	.9999 6614
3.35	.9999 9891	.9999 9779	.9999 9580	.9999 9241	.9999 7832
3.40	.9999 9933	.9999 9863	.9999 9737	.9999 9523	.9999 8623
3.45	.9999 9959	.9999 9915	.9999 9837	.9999 9702	.9999 9133
3.50	.9999 9975	.9999 9948	.9999 9899	.9999 9816	.9999 9458
3.55	.9999 9985	.9999 9968	.9999 9938	.9999 9887	.9999 9664
3.60	.9999 9991	.9999 9981	.9999 9963	.9999 9931	.9999 9793
3.65	.9999 9994	.9999 9988	.9999 9977	.9999 9958	.9999 9874
3.70	.9999 9997	.9999 9993	.9999 9986	.9999 9975	.9999 9924
3.75	.9999 9998	.9999 9996	.9999 9992	.9999 9985	.9999 9954
3.80	.9999 9999	.9999 9998	.9999 9995	.9999 9991	.9999 9973
3.85	.9999 9999	.9999 9999	.9999 9997	.9999 9995	.9999 9984
3.90	1.0000 0000	.9999 9999	.9999 9998	.9999 9997	.9999 9990
3.95		1.0000 0000	.9999 9999	.9999 9998	.9999 9994
4.00			.9999 9999	.9999 9999	.9999 9997
4.05			1.0000 0000	.9999 9999	.9999 9998
4.10				1.0000 0000	.9999 9999
4.15					.9999 9999
4.20					1.0000 0000
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_4	$P(W_4, .24)$	$P(W_4, .26)$	$P(W_4, .28)$	$P(W_4, .30)$	$P(W_4, .32)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30	.0000 0000				
0.35	.0000 0003	.0000 0000			
0.40	.0000 0019	.0000 0001			
0.45	.0000 0091	.0000 0007	.0000 0000		
0.50	.0000 0359	.0000 0031	.0000 0003	.0000 0000	
0.55	.0000 1208	.0000 0127	.0000 0013	.0000 0001	.0000 0000
0.60	.0000 3569	.0000 0445	.0000 0052	.0000 0006	.0000 0001
0.65	.0000 9446	.0000 1373	.0000 0186	.0000 0024	.0000 0003
0.70	.0002 2736	.0000 3802	.0000 0593	.0000 0087	.0000 0012
0.75	.0005 0389	.0000 9591	.0000 1704	.0000 0286	.0000 0046
0.80	.0010 3866	.0002 2291	.0000 4469	.0000 0846	.0000 0152
0.85	.0020 0761	.0004 8176	.0001 0805	.0000 2289	.0000 0462
0.90	.0036 6364	.0009 7564	.0002 4300	.0000 5719	.0000 1282
0.95	.0063 4840	.0018 6346	.0005 1194	.0001 3297	.0000 3291
1.00	.0104 9681	.0033 7530	.0010 1661	.0002 8965	.0000 7868
1.05	.0166 3079	.0058 2530	.0019 1284	.0005 9452	.0001 7625
1.10	.0253 4040	.0096 1866	.0034 2583	.001. 5565	.0003 7201
1.15	.0372 5155	.0152 4947	.0058 6326	.0021 3665	.0007 4339
1.20	.0529 8209	.0232 8660	.0096 2308	.0037 7287	.0014 1230
1.25	.0730 8991	.0343 4654	.0151 9257	.0063 7[illegible]	.0025 6023
1.30	.0980 1845	.0490 5380	.0231 3601	.0103 6729	.0044 4325
1.35	.1280 4588	.0679 9149	.0340 6922	.0162 3440	.0074 0398
1.40	.1632 4430	.0916 4702	.0486 2128	.0245 5483	.0118 7743
1.45	.2034 5425	.1203 5874	.0673 8588	.0359 5271	.0183 8714
1.50	.2482 7802	.1542 7019	.0908 6660	.0510 6245	.0275 2901
1.55	.2970 9286	.1932 9768	.1194 2213	.0704 7879	.0399 4141
1.60	.3490 8306	.2371 1600	.1532 1810	.0947 0076	.0562 6236
1.65	.4032 8728	.2851 6424	.1921 9182	.1240 7588	.0770 7654
1.70	.4586 5622	.3366 7176	.2360 3481	.1587 5131	.1028 5738
1.75	.5141 1475	.3907 0153	.2841 9615	.1986 3866	.1339 1062
1.80	.5686 2258	.4462 0633	.3359 0668	.2433 9741	.1703 2678
1.85	.6212 2814	.5020 9195	.3902 2185	.2924 3992	.2119 4884
1.90	.6711 1181	.5572 8099	.4460 7869	.3449 5813	.2583 6036
1.95	.7176 1584	.6107 7156	.5023 6069	.3999 6944	.3088 9618
2.00	.7602 6022	.6616 8606	.5579 6431	.4563 7672	.3626 7547
2.05	.7987 4506	.7093 0664	.6118 6054	.5130 3621	.4186 5355
2.10	.8329 4118	.7530 9613	.6631 4646	.5688 2636	.4756 8716
2.15	.8628 7161	.7927 0428	.7110 8318	.6227 1077	.5326 0591
2.20	.8886 8683	.8279 6111	.7551 1828	.6737 9026	.5882 8276
2.25	.9106 3674	.8588 5959	.7948 9299	.7213 4009	.6416 9671
2.30	.9290 4191	.8855 3107	.8302 3538	.7648 3089	.6919 8258
2.35	.9442 6652	.9082 1628	.8611 4248	.8039 3356	.7384 6460
2.40	.9566 9421	.9272 3518	.8877 5434	.8385 0984	.7806 7262
2.45	.9667 0816	.9429 5785	.9103 2367	.8685 9170	.8183 4191
2.50	.9746 7556	.9557 7850	.9291 8411	.8943 5296	.8513 9886

W_4	$P(W_4, 24)$	$P(W_4, 26)$	$P(W_4, 28)$	$P(W_4, 30)$	$P(W_4, 32)$
2.55	.9809 3654	.9660 9359	.9447 1973	.9160 7690	.8799 3608
2.60	.9857 9719	.9742 8474	.9573 3791	.9341 2298	.9041 8068
2.65	.9895 2611	.9807 0645	.9674 4663	.9488 9554	.9244 5961
2.70	.9923 5364	.9856 7816	.9754 3686	.9608 1637	.9411 6540
2.75	.9944 7331	.9894 8028	.9816 7010	.9703 0225	.9547 2468
2.80	.9960 4459	.9923 5315	.9864 7055	.9777 4793	.9655 7157
2.85	.9971 9661	.9944 9840	.9901 2129	.9835 1450	.9741 2649
2.90	.9980 3216	.9960 8188	.9928 6362	.9879 2249	.9807 8085
2.95	.9986 3175	.9972 3750	.9948 9881	.9912 4903	.9858 8717
3.00	.9990 5756	.9980 7151	.9963 9141	.9937 2810	.9897 5394
3.05	.9993 5686	.9986 6686	.9974 7341	.9955 5301	.9926 4426
3.10	.9995 6512	.9990 8729	.9982 4886	.9968 8026	.9947 7742
3.15	.9997 0860	.9993 8108	.9987 9843	.9978 3420	.9963 3227
3.20	.9998 0649	.9995 8425	.9991 8364	.9985 1193	.9974 5183
3.25	.9998 7263	.9997 2331	.9994 5075	.9989 8796	.9982 4838
3.30	.9999 1689	.9998 1755	.9996 3401	.9993 1861	.9988 0849
3.35	.9999 4624	.9998 8078	.9997 5844	.9995 4577	.9991 9783
3.40	.9999 6553	.9999 2280	.9998 4206	.9997 0015	.9994 6543
3.45	.9999 7808	.9999 5045	.9998 9768	.9998 0397	.9996 4733
3.50	.9999 8618	.9999 6847	.9999 3432	.9998 7306	.9997 6963
3.55	.9999 9136	.9999 8011	.9999 5822	.9999 1857	.9998 5098
3.60	.9999 9464	.9999 8756	.9999 7366	.9999 4825	.9999 0453
3.65	.9999 9670	.9999 9229	.9999 8354	.9999 6741	.9999 3942
3.70	.9999 9799	.9999 9526	.9999 8980	.9999 7966	.9999 6191
3.75	.9999 9878	.9999 9711	.9999 9374	.9999 8742	.9999 7628
3.80	.9999 9927	.9999 9825	.9999 9619	.9999 9229	.9999 8536
3.85	.9999 9956	.9999 9895	.9999 9770	.9999 9531	.9999 9104
3.90	.9999 9974	.9999 9938	.9999 9862	.9999 9718	.9999 9457
3.95	.9999 9985	.9999 9963	.9999 9918	.9999 9831	.9999 9674
4.00	.9999 9991	.9999 9978	.9999 9952	.9999 9900	.9999 9806
4.05	.9999 9995	.9999 9987	.9999 9972	.9999 9941	.9999 9885
4.10	.9999 9997	.9999 9993	.9999 9984	.9999 9966	.9999 9933
4.15	.9999 9998	.9999 9996	.9999 9991	.9999 9980	.9999 9961
4.20	.9999 9999	.9999 9998	.9999 9995	.9999 9989	.9999 9978
4.25	.9999 9999	.9999 9999	.9999 9997	.9999 9994	.9999 9987
4.30	1.0000 0000	.9999 9999	.9999 9998	.9999 9996	.9999 9993
4.35		1.0000 0000	.9999 9999	.9999 9998	.9999 9996
4.40			.9999 9999	.9999 9999	.9999 9998
4.45			1.0000 0000	.9999 9999	.9999 9999
4.50				1.0000 0000	.9999 9999
4.55					1.0000 0000
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_4	$P(W_4, .34)$	$P(W_4, .36)$	$P(W_4, .38)$	$P(W_4, .40)$	$P(W_4, .50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65	.0000 0000				
0.70	.0000 0002	.0000 0000			
0.75	.0000 0007	.0000 0001	.0000 0000		
0.80	.0000 0026	.0000 0004	.0000 0001	.0000 0000	
0.85	.0000 0089	.0000 0017	.0000 0003	.0000 0001	
0.90	.0000 0276	.0000 0057	.0000 0011	.0000 0002	
0.95	.0000 0781	.0000 0179	.0000 0040	.0000 0009	
1.00	.0000 2050	.0000 0515	.0000 0125	.0000 0030	
1.05	.0000 5015	.0000 1376	.0000 0366	.0000 0095	
1.10	.0001 1497	.0000 3429	.0000 0991	.0000 0278	.0000 0000
1.15	.0002 4842	.0000 8012	.0000 2505	.0000 0761	.0000 0001
1.20	.0005 0811	.0001 7650	.0000 5943	.0000 1946	.0000 0005
1.25	.0009 8775	.0003 6805	.0001 3298	.0000 4674	.0000 0018
1.30	.0018 3144	.0007 2936	.0002 8172	.0001 0589	.0000 0057
1.35	.0032 4918	.0013 7819	.0005 6717	.0002 2718	.0000 0170
1.40	.0055 3132	.0024 9084	.0010 8862	.0004 6321	.0000 0469
1.45	.0090 5893	.0043 1767	.0019 9797	.0009 0038	.0000 1219
1.50	.0143 0668	.0071 9635	.0035 1577	.0016 7323	.0000 2985
1.55	.0218 3481	.0115 5931	.0059 4607	.0029 8058	.0000 6914
1.60	.0322 6773	.0179 3187	.0096 8710	.0051 0140	.0001 5195
1.65	.0462 5867	.0269 1786	.0152 3385	.0084 0764	.0003 1778
1.70	.0644 4155	.0391 7093	.0231 6924	.0133 7014	.0006 3405
1.75	.0873 7414	.0553 5177	.0341 4100	.0205 5385	.0012 0980
1.80	.1154 7819	.0760 7374	.0488 2375	.0305 9929	.0022 1245
1.85	.1489 8380	.1018 4199	.0678 6757	.0441 8859	.0038 8598
1.90	.1878 8556	.1329 9304	.0918 3743	.0619 9681	.0065 6809
1.95	.2319 1664	.1696 4235	.1211 4971	.0846 3203	.0107 0240
2.00	.2805 4533	.2116 4759	.1560 1392	.1125 7014	.0168 4131
2.05	.3329 9542	.2585 9317	.1963 8748	.1460 9211	.0256 3497
2.10	.3882 8873	.3097 9927	.2419 5056	.1852 3241	.0378 0328
2.15	.4453 0534	.3643 5519	.2921 0546	.2297 4619	.0540 8965
2.20	.5028 5490	.4211 7387	.3460 0189	.2791 0087	.0751 9882
2.25	.5597 5136	.4790 6139	.4025 8582	.3324 9465	.1017 2400
2.30	.6148 8350	.5367 9389	.4606 6669	.3889 0064	.1340 7188
2.35	.6672 7484	.5931 9373	.5189 9541	.4471 3196	.1723 9562
2.40	.7161 2805	.6471 9733	.5763 4460	.5059 2034	.2165 4609
2.45	.7608 5170	.6979 0875	.6315 8264	.5639 9953	.2660 4975
2.50	.8010 6882	.7446 3547	.6837 3482	.6201 8442	.3201 1811

W_4	$P(W_4, .34)$	$P(W_4, .36)$	$P(W_4, .38)$	$P(W_4, .40)$	$P(W_4, .50)$
2.55	.8366 0926	.7869 0499	.7320 2666	.6734 3818	.3776 8919
2.60	.8674 8879	.8244 6342	.7759 0747	.7229 2188	.4374 9657
2.65	.8938 7905	.8572 5861	.8150 5426	.7680 2354	.4981 5809
2.70	.9160 7231	.8854 1203	.8493 5863	.8083 6653	.5582 7323
2.75	.9344 4513	.9091 8357	.8789 0037	.8437 9932	.6165 1803
2.80	.9494 2373	.9289 3357	.9039 1239	.8743 7042	.6717 2719
2.85	.9614 5371	.9450 8575	.9247 4156	.9002 9331	.7229 5574
2.90	.9709 7527	.9580 9384	.9418 0957	.9219 0619	.7695 1599
2.95	.9784 0450	.9684 1364	.9555 7692	.9396 3094	.8109 8902
3.00	.9841 2075	.9764 8143	.9665 1240	.9539 3508	.8472 1319
3.05	.9884 5931	.9826 9882	.9750 6901	.9652 9891	.8782 5447
3.10	.9917 0847	.9874 2350	.9816 6669	.9741 8950	.9043 6448
3.15	.9941 1014	.9909 6494	.9866 8148	.9810 4178	.9259 3246
3.20	.9958 6277	.9935 8409	.9904 4006	.9862 4639	.9434 3693
3.25	.9971 2581	.9954 9586	.9932 1874	.9901 4341	.9574 0124
3.30	.9980 2490	.9968 7348	.9952 4563	.9930 2087	.9683 5613
3.35	.9986 5724	.9978 5377	.9967 0483	.9951 1667	.9768 1079
3.40	.9990 9674	.9985 4277	.9977 4194	.9966 2287	.9832 3259
3.45	.9993 9870	.9990 2121	.9984 6982	.9976 9129	.9880 3500
3.50	.9996 0381	.9993 4954	.9989 7442	.9984 3951	.9915 7225
3.55	.9997 4159	.9995 7224	.9993 2004	.9989 5697	.9941 3928
3.60	.9998 3313	.9997 2159	.9995 5397	.9993 1048	.9959 7544
3.65	.9998 9330	.9998 2063	.9997 1048	.9995 4909	.9972 7037
3.70	.9999 3243	.9998 8559	.9998 1401	.9997 0825	.9981 7107
3.75	.9999 5762	.9999 2775	.9998 8173	.9998 1321	.9987 8916
3.80	.9999 7367	.9999 5481	.9999 2554	.9998 8164	.9992 0775
3.85	.9999 8379	.9999 7201	.9999 5359	.9999 2576	.9994 8760
3.90	.9999 9011	.9999 8282	.9999 7135	.9999 5390	.9996 7235
3.95	.9999 9403	.9999 8956	.9999 8248	.9999 7165	.9997 9281
4.00	.9999 9642	.9999 9371	.9999 8939	.9999 8274	.9998 7042
4.05	.9999 9787	.9999 9625	.9999 9363	.9999 8959	.9999 1983
4.10	.9999 9875	.9999 9778	.9999 9622	.9999 9378	.9999 5092
4.15	.9999 9927	.9999 9870	.9999 9777	.9999 9632	.9999 7026
4.20	.9999 9958	.9999 9924	.9999 9870	.9999 9784	.9999 8217
4.25	.9999 9976	.9999 9956	.9999 9925	.9999 9874	.9999 8941
4.30	.9999 9986	.9999 9975	.9999 9957	.9999 9928	.9999 9378
4.35	.9999 9992	.9999 9986	.9999 9975	.9999 9959	.9999 9638
4.40	.9999 9996	.9999 9992	.9999 9986	.9999 9977	.9999 9791
4.45	.9999 9998	.9999 9996	.9999 9992	.9999 9987	.9999 9881
4.50	.9999 9999	.9999 9998	.9999 9996	.9999 9993	.9999 9933
4.55	.9999 9999	.9999 9999	.9999 9998	.9999 9996	.9999 9962
4.60	1.0000 0000	.9999 9999	.9999 9999	.9999 9998	.9999 9979
4.65		1.0000 0000	.9999 9999	.9999 9999	.9999 9988
4.70			1.0000 0000	.9999 9999	.9999 9994
4.75				1.0000 0000	.9999 9997
4.80					.9999 9998
4.85					.9999 9999
4.90					.9999 9999
4.95					1.0000 0000
5.00					

W_4	$P(W_4, .60)$	$P(W_4, .70)$	$P(W_4, .80)$	$P(W_4, .90)$	$P(W_4, 1.00)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20					
1.25					
1.30	.0000 0000				
1.35	.0000 0001				
1.40	.0000 0003				
1.45	.0000 0011				
1.50	.0000 0036	.0000 0000			
1.55	.0000 0110	.0000 0001			
1.60	.0000 0311	.0000 0005			
1.65	.0000 0827	.0000 0017	.0000 0000		
1.70	.0000 2078	.0000 0053	.0000 0001		
1.75	.0000 4941	.0000 0157	.0000 0004		
1.80	.0001 1146	.0000 0437	.0000 0014	.0000 0000	
1.85	.0002 3920	.0000 1148	.0000 0046	.0000 0002	
1.90	.0004 8945	.0000 2850	.0000 0138	.0000 0006	.0000 0000
1.95	.0009 5705	.0000 6704	.0000 0392	.0000 0020	.0000 0001
2.00	.0017 9199	.0001 4976	.0000 1047	.0000 0064	.0000 0003
2.05	.0032 1927	.0003 1846	.0000 2639	.0000 0191	.0000 0012
2.10	.0055 5901	.0006 4597	.0000 6298	.0000 0536	.0000 0041
2.15	.0092 4304	.0012 5246	.0001 4266	.0000 1421	.0000 0127
2.20	.0148 2290	.0023 2559	.0003 0733	.0000 3556	.0000 0370
2.25	.0229 6395	.0041 4303	.0006 3098	.0000 8425	.0000 1013
2.30	.0344 2089	.0070 9380	.0012 3707	.0001 8939	.0000 2613
2.35	.0499 9243	.0116 9349	.0023 2043	.0004 0485	.0000 6372
2.40	.0704 5614	.0185 8727	.0041 7177	.0008 2461	.0001 4719
2.45	.0964 8851	.0285 3463	.0072 0130	.0016 0345	.0003 2278
2.50	.1285 7948	.0423 7145	.0119 5551	.0029 8212	.0006 7333

W_4	$P(W_4,.60)$	$P(W_4,.70)$	$P(W_4,.80)$	$P(W_4,.90)$	$P(W_4,.100)$
2.55	.1669 5299	.0609 4822	.0191 2055	.0053 1418	.0013 3876
2.60	.2115 0617	.0850 4805	.0295 0492	.0090 8949	.0025 4189
2.65	.2617 7795	.1152 9259	.0439 9679	.0149 4743	.0046 1728
2.70	.3169 5381	.1520 4859	.0634 9463	.0236 7165	.0080 3824
2.75	.3759 0847	.1953 4936	.0888 1550	.0361 5937	.0134 3481
2.80	.4372 8186	.2448 4524	.1205 9086	.0533 6123	.0215 9388
2.85	.4995 7917	.2997 9305	.1591 6463	.0761 9299	.0334 3298
2.90	.5612 8215	.3590 8901	.2045 1007	.1054 2720	.0499 4248
2.95	.6209 5796	.4213 4248	.2561 8118	.1415 7863	.0720 9597
3.00	.6773 5306	.4849 8119	.3133 0935	.1848 0191	.1007 3635
3.05	.7294 6286	.5483 7411	.3746 4896	.2348 1983	.1364 5206
3.10	.7765 7207	.6099 5566	.4386 6737	.2908 9743	.1794 6303
3.15	.8182 6513	.6683 3621	.5036 6723	.3518 6986	.2295 3754
3.20	.8544 1001	.7223 8659	.5679 2431	.4162 2256	.2859 5737
3.25	.8851 2138	.7712 8972	.6298 2208	.4822 1339	.3475 4151
3.30	.9107 1058	.8145 5766	.6879 6631	.5480 1922	.4127 2785
3.35	.9316 2987	.8520 1709	.7412 6747	.6118 8620	.4797 0221
3.40	.9484 1746	.8837 7019	.7889 8463	.6722 6358	.5465 5575
3.45	.9616 4850	.9101 3935	.8307 3108	.7279 0529	.6114 4757
3.50	.9718 9480	.9316 0474	.8664 4685	.7779 3014	.6727 5008
3.55	.9796 9501	.9487 4239	.8963 4713	.8218 3880	.7291 5924
3.60	.9855 3486	.9621 6895	.9208 5666	.8594 9205	.7797 5947
3.65	.9898 3653	.9724 9657	.9405 4003	.8910 5963	.8240 4109
3.70	.9929 5536	.9802 9980	.9560 3606	.9169 5103	.8618 7561
3.75	.9951 8193	.9860 9400	.9680 0186	.9377 3956	.8934 5918
3.80	.9967 4774	.9903 2418	.9770 6957	.9540 8951	.9192 3704
3.85	.9978 3281	.9933 6202	.9838 1667	.9666 9307	.9398 2148
3.90	.9985 7403	.9955 0884	.9887 4860	.9762 2118	.9559 1392
3.95	.9990 7333	.9970 0246	.9922 9194	.9832 8924	.9682 3845
4.00	.9994 0510	.9980 2590	.9947 9520	.9884 3688	.9774 9074
4.05	.9996 2264	.9987 1683	.9965 3499	.9921 1952	.9843 0338
4.10	.9997 6343	.9991 7659	.9977 2507	.9947 0875	.9892 2622
4.15	.9998 5339	.9994 7823	.9985 2662	.9964 9875	.9927 1915
4.20	.9999 1016	.9996 7342	.9990 5839	.9977 1611	.9951 5396
4.25	.9999 4556	.9997 9806	.9994 0605	.9985 3091	.9968 2225
4.30	.9999 6737	.9998 7660	.9996 3011	.9990 6788	.9979 4638
4.35	.9999 8065	.9999 2546	.9997 7251	.9994 1646	.9986 9164
4.40	.9999 8864	.9999 5549	.9998 6180	.9996 3944	.9991 7798
4.45	.9999 9340	.9999 7371	.9999 1704	.9997 8006	.9994 9054
4.50	.9999 9621	.9999 8465	.9999 5079	.9998 6751	.9996 8843
4.55	.9999 9784	.9999 9113	.9999 7114	.9999 2116	.9998 1192
4.60	.9999 9878	.9999 9493	.9999 8326	.9999 5365	.9998 8790
4.65	.9999 9932	.9999 9713	.9999 9040	.9999 7307	.9999 3401
4.70	.9999 9962	.9999 9839	.9999 9455	.9999 8453	.9999 6162
4.75	.9999 9979	.9999 9911	.9999 9694	.9999 9121	.9999 7795
4.80	.9999 9989	.9999 9951	.9999 9830	.9999 9506	.9999 8747
4.85	.9999 9994	.9999 9973	.9999 9907	.9999 9726	.9999 9296
4.90	.9999 9997	.9999 9986	.9999 9949	.9999 9849	.9999 9609
4.95	.9999 9998	.9999 9992	.9999 9973	.9999 9918	.9999 9785
5.00	.9999 9999	.9999 9996	.9999 9985	.9999 9956	.9999 9883

W_4	$P(W_4, .60)$	$P(W_4, .70)$	$P(W_4, .80)$	$P(W_4, .90)$	$P(W_4, .100)$
5.05	1.0000 0000	.9999 9998	.9999 9992	.9999 9976	.9999 9937
5.10		.9999 9999	.9999 9996	.9999 9988	.9999 9967
5.15		.9999 9999	.9999 9998	.9999 9993	.9999 9982
5.20		1.0000 0000	.9999 9999	.9999 9997	.9999 9991
5.25			.9999 9999	.9999 9998	.9999 9995
5.30			1.0000 0000	.9999 9999	.9999 9998
5.35				1.0000 0000	.9999 9999
5.40					.9999 9999
5.45					1.0000 0000
5.50					
5.55					
5.60					
5.65					
5.70					
5.75					
5.80					
5.85					
5.90					
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_5	$P(W_5, .12)$	$P(W_5, .13)$	$P(W_5, .14)$	$P(W_5, .15)$	$P(W_5, .16)$
0.05	.2030 1465	.0240 2135	.0020 8828	.0001 4760	.0000 0897
0.10	.3679 2989	.0839 3277	.0143 2119	.0020 0151	.0002 4138
0.15	.5011 9897	.1649 8832	.0413 7733	.0085 6687	.0015 3672
0.20	.6083 3077	.2563 6648	.0838 6939	.0228 4076	.0054 1257
0.25	.6939 9769	.3503 7454	.1399 5470	.0469 4708	.0137 6627
0.30	.7621 3723	.4417 7120	.2065 0716	.0818 1161	.0284 7168
0.35	.8160 4637	.5271 9866	.2799 3453	.1271 7852	.0510 2134
0.40	.8584 6813	.6047 1372	.3567 1631	.1818 1856	.0822 8589
0.45	.8916 7013	.6734 0701	.4337 2841	.2438 2180	.1224 0905
0.50	.9175 1505	.7330 9917	.5084 1041	.3109 0242	.1708 2436
0.55	.9375 2328	.7841 0301	.5788 2173	.3806 7152	.2263 6280
0.60	.9529 2788	.8270 4126	.6436 2392	.4508 5458	.2874 1593
0.65	.9647 2263	.8627 1043	.7020 1783	.5194 4566	.3521 2063
0.70	.9737 0331	.8919 8203	.7536 5715	.5848 0040	.4185 3860
0.75	.9805 0318	.9157 3363	.7985 5397	.6456 7606	.4848 1117
0.80	.9856 2293	.9348 0318	.8369 8656	.7012 2964	.5492 7869
0.85	.9894 5597	.9499 6102	.8694 1608	.7509 8592	.6105 6025
0.90	.9923 0943	.9618 9502	.8964 1549	.7947 8656	.6675 9532
0.95	.9944 2155	.9712 0510	.9186 1208	.8327 2964	.7196 5206
1.00	.9959 7601	.9784 0421	.9366 4331	.8651 0715	.7663 0980
1.05	.9971 1346	.9839 2343	.9511 2491	.8923 4575	.8074 2299
1.10	.9979 4098	.9881 1957	.9626 2941	.9149 5441	.8430 7439
1.15	.9985 3953	.9912 8388	.9716 7335	.9334 8063	.8735 2374
1.20	.9989 6993	.9936 5109	.9787 1122	.9484 7603	.8991 5706
1.25	.9992 7762	.9954 0813	.9841 3439	.9604 7088	.9204 4021
1.30	.9994 9630	.9967 0225	.9882 7351	.9699 5678	.9378 7900
1.35	.9996 5079	.9976 4818	.9914 0328	.9773 7617	.9519 8687
1.40	.9997 5929	.9983 3440	.9937 4835	.9831 1741	.9632 6051
1.45	.9998 3504	.9988 2853	.9954 8981	.9875 1400	.9721 6263
1.50	.9998 8761	.9991 8172	.9967 7175	.9908 4681	.9791 1133
1.55	.9999 2387	.9994 3234	.9977 0731	.9933 4826	.9844 7462
1.60	.9999 4874	.9996 0888	.9983 8431	.9952 0756	.9885 6912
1.65	.9999 6569	.9997 3235	.9988 7012	.9965 7643	.9916 6170
1.70	.9999 7717	.9998 1808	.9992 1586	.9975 7483	.9939 7321
1.75	.9999 8490	.9998 7719	.9994 5991	.9982 9636	.9956 8331
1.80	.9999 9007	.9999 1765	.9996 3080	.9988 1307	.9969 3579
1.85	.9999 9351	.9999 4515	.9997 4950	.9991 7982	.9978 4410
1.90	.9999 9578	.9999 6371	.9998 3130	.9994 3784	.9984 9644
1.95	.9999 9728	.9999 7616	.9998 8723	.9996 1778	.9989 6049
2.00	.9999 9825	.9999 8444	.9999 2517	.9997 4221	.9992 8749
2.05	.9999 9888	.9999 8991	.9999 5071	.9998 2750	.9995 1579
2.10	.9999 9929	.9999 9350	.9999 6777	.9998 8549	.9996 7371
2.15	.9999 9955	.9999 9584	.9999 7908	.9999 2458	.9997 8198
2.20	.9999 9972	.9999 9736	.9999 8652	.9999 5071	.9998 5553
2.25	.9999 9983	.9999 9833	.9999 9137	.9999 6804	.9999 0506
2.30	.9999 9989	.9999 9896	.9999 9452	.9999 7943	.9999 3812
2.35	.9999 9993	.9999 9935	.9999 9654	.9999 8687	.9999 6000
2.40	.9999 9996	.9999 9960	.9999 9784	.9999 9168	.9999 7435
2.45	.9999 9998	.9999 9975	.9999 9866	.9999 9477	.9999 8368
2.50	.9999 9999	.9999 9985	.9999 9917	.9999 9673	.9999 8971

W_5	$P(W_5,12)$	$P(W_5,13)$	$P(W_5,14)$	$P(W_5,15)$	$P(W_5,16)$
2.55	.9999 9999	.9999 9991	.9999 9949	.9999 9798	.9999 9356
2.60	.9999 9999	.9999 9994	.9999 9969	.9999 9876	.9999 9600
2.65	1.0000 0000	.9999 9997	.9999 9981	.9999 9924	.9999 9754
2.70		.9999 9998	.9999 9989	.9999 9954	.9999 9849
2.75		.9999 9999	.9999 9993	.9999 9972	.9999 9909
2.80		.9999 9999	.9999 9996	.9999 9984	.9999 9945
2.85		1.0000 0000	.9999 9998	.9999 9990	.9999 9967
2.90			.9999 9999	.9999 9994	.9999 9981
2.95			.9999 9999	.9999 9997	.9999 9989
3.00			1.0000 0000	.9999 9998	.9999 9993
3.05				.9999 9999	.9999 9996
3.10				.9999 9999	.9999 9998
3.15				1.0000 0000	.9999 9999
3.20					.9999 9999
3.25					1.0000 0000
3.30					
3.35					
3.40					
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_5	$P(W_5, 17)$	$P(W_5, 18)$	$P(W_5, 19)$	$P(W_5, 20)$	$P(W_5, 22)$
0.05	.0000 0049	.0000 0002	.0000 0000	.0000 0000	
0.10	.0000 2597	.0000 0255	.0000 0023	.0000 0002	.0000 0000
0.15	.0002 4646	.0000 3612	.0000 0491	.0000 0063	.0000 0001
0.20	.0011 4963	.0002 2348	.0000 4037	.0000 0686	.0000 0017
0.25	.0036 2786	.0008 7647	.0001 9700	.0000 4166	.0000 0160
0.30	.0089 3076	.0025 7279	.0006 9037	.0001 7443	.0000 0960
0.35	.0185 0581	.0061 7663	.0019 2275	.0005 6410	.0000 4194
0.40	.0337 8038	.0127 8804	.0045 2149	.0015 0815	.0001 4522
0.45	.0559 4168	.0236 2859	.0093 3548	.0034 8322	.0004 2056
0.50	.0857 5923	.0398 8804	.0173 8239	.0071 6173	.0010 5676
0.55	.1234 7635	.0625 6280	.0297 5195	.0133 9341	.0023 6508
0.60	.1687 7922	.0923 1609	.0474 8105	.0231 4813	.0048 0682
0.65	.2208 3712	.1293 8182	.0714 2235	.0374 2554	.0090 0378
0.70	.2783 9772	.1735 2391	.1021 2848	.0571 4436	.0157 2356
0.75	.3399 1685	.2240 5202	.1397 6956	.0830 2880	.0258 3594
0.80	.4037 0143	.2798 8623	.1840 9545	.1155 0989	.0402 4216
0.85	.4680 4732	.3396 5695	.2344 4532	.1546 5669	.0597 8500
0.90	.5313 5817	.4018 2405	.2898 0042	.2001 4683	.0851 5165
0.95	.5922 3668	.4647 9915	.3488 6986	.2512 7923	.1167 8363
1.00	.6495 4478	.5270 5776	.4101 9634	.3070 2533	.1548 0721
1.05	.7024 3315	.5872 3121	.4722 6783	.3661 1030	.1989 9458
1.10	.7503 4388	.6441 7285	.5336 2261	.4271 1244	.2487 6133
1.15	.7929 9162	.6969 9689	.5929 3802	.4885 6831	.3031 9999
1.20	.8303 2968	.7450 9114	.6490 9645	.5490 7159	.3611 4462
1.25	.8625 0707	.7881 0792	.7012 2622	.6073 5685	.4212 5733
1.30	.8898 2212	.8259 3806	.7487 1769	.6623 6178	.4821 2581
1.35	.9126 7693	.8586 7379	.7912 1777	.7132 6547	.5423 6028
1.40	.9315 3598	.8865 6599	.8286 0735	.7595 0297	.6006 8028
1.45	.9468 9079	.9099 8028	.8609 6705	.8007 5904	.6559 8350
1.50	.9592 3163	.9293 5568	.8885 3634	.8369 4541	.7073 9255
1.55	.9690 2640	.9451 6825	.9116 7090	.8681 6659	.7542 7845
1.60	.9767 0622	.9579 0112	.9308 0178	.8946 7952	.7962 6220
1.65	.9826 5676	.9680 2145	.9463 9909	.9168 5143	.8331 9821
1.70	.9872 1439	.9759 6409	.9589 4174	.9351 1971	.8651 4420
1.75	.9906 6596	.9821 2123	.9688 9403	.9499 5634	.8923 2264
1.80	.9932 5119	.9868 3719	.9766 8882	.9618 3846	.9150 7881
1.85	.9951 6670	.9904 0709	.9827 1687	.9712 2567	.9338 3940
1.90	.9965 7100	.9930 7855	.9873 2123	.9785 4404	.9490 7491
1.95	.9975 8985	.9950 5529	.9907 9582	.9841 7608	.9612 6781
2.00	.9983 2153	.9965 0192	.9933 8695	.9884 5584	.9708 8745
2.05	.9988 4170	.9975 4917	.9952 9695	.9916 6799	.9783 7200
2.10	.9992 0787	.9982 9927	.9966 8892	.9940 4980	.9841 1670
2.15	.9994 6311	.9988 3093	.9976 9207	.9957 9504	.9884 6779
2.20	.9996 3932	.9992 0390	.9984 0712	.9970 5902	.9917 2075
2.25	.9997 5982	.9994 6290	.9989 1133	.9979 6401	.9941 2194
2.30	.9998 4146	.9996 4095	.9992 6310	.9986 0473	.9958 7239
2.35	.9998 9625	.9997 6216	.9995 0596	.9990 5336	.9971 3292
2.40	.9999 3268	.9998 4387	.9996 7191	.9993 6407	.9980 2979
2.45	.9999 5669	.9998 9843	.9997 8415	.9995 7697	.9986 6042
2.50	.9999 7238	.9999 3450	.9998 5931	.9997 2132	.9990 9872

W_5	$P(W_5 \cdot 17)$	$P(W_5 \cdot 18)$	$P(W_5 \cdot 19)$	$P(W_5 \cdot 20)$	$P(W_5 \cdot 22)$
2.55	.9999 8253	.9999 5814	.9999 0914	.9998 1817	.9993 9988
2.60	.9999 8904	.9999 7348	.9999 4186	.9998 8249	.9996 0450
2.65	.9999 9318	.9999 8334	.9999 6313	.9999 2477	.9997 4198
2.70	.9999 9579	.9999 8963	.9999 7683	.9999 5228	.9998 3336
2.75	.9999 9743	.9999 9359	.9999 8557	.9999 7002	.9998 9345
2.80	.9999 9844	.9999 9608	.9999 9109	.9999 8133	.9999 3253
2.85	.9999 9906	.9999 9762	.9999 9455	.9999 8848	.9999 5770
2.90	.9999 9944	.9999 9857	.9999 9669	.9999 9296	.9999 7373
2.95	.9999 9967	.9999 9914	.9999 9801	.9999 9573	.9999 8384
3.00	.9999 9980	.9999 9949	.9999 9881	.9999 9744	.9999 9016
3.05	.9999 9989	.9999 9970	.9999 9930	.9999 9847	.9999 9406
3.10	.9999 9993	.9999 9983	.9999 9959	.9999 9910	.9999 9645
3.15	.9999 9996	.9999 9990	.9999 9976	.9999 9947	.9999 9790
3.20	.9999 9998	.9999 9994	.9999 9986	.9999 9969	.9999 9876
3.25	.9999 9999	.9999 9997	.9999 9992	.9999 9982	.9999 9928
3.30	.9999 9999	.9999 9998	.9999 9996	.9999 9990	.9999 9959
3.35	1.0000 0000	.9999 9999	.9999 9997	.9999 9994	.9999 9976
3.40		.9999 9999	.9999 9999	.9999 9997	.9999 9987
3.45		1.0000 0000	.9999 9999	.9999 9998	.9999 9992
3.50			1.0000 0000	.9999 9999	.9999 9996
3.55				.9999 9999	.9999 9998
3.60				1.0000 0000	.9999 9999
3.65					.9999 9999
3.70					1.0000 0000
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_5	$P(W_5 \cdot 24)$	$P(W_5 \cdot 26)$	$P(W_5 \cdot 28)$	$P(W_5 \cdot 30)$	$P(W_5 \cdot 32)$
0.05					
0.10					
0.15					
0.20	.0000 0000				
0.25	.0000 0005	.0000 0000			
0.30	.0000 0045	.0000 0002	.0000 0000		
0.35	.0000 0267	.0000 0015	.0000 0001		
0.40	.0000 1197	.0000 0087	.0000 0006	.0000 0000	
0.45	.0000 4355	.0000 0399	.0000 0033	.0000 0003	.0000 0000
0.50	.0001 3400	.0000 1506	.0000 0154	.0000 0014	.0000 0001
0.55	.0003 5964	.0000 4854	.0000 0594	.0000 0067	.0000 0007
0.60	.0008 6146	.0001 3722	.0000 1985	.0000 0265	.0000 0033
0.65	.0018 7396	.0003 4717	.0000 5846	.0000 0909	.0000 0132
0.70	.0037 5266	.0007 9848	.0001 5460	.0000 2766	.0000 0463
0.75	.0069 9284	.0016 9030	.0003 7220	.0000 7580	.0000 1445
0.80	.0122 3200	.0033 2661	.0008 2514	.0001 8945	.0000 4073
0.85	.0202 2991	.0061 3703	.0017 0024	.0004 3641	.0001 0496
0.90	.0318 2362	.0106 8598	.0032 8156	.0009 3453	.0002 4954
0.95	.0478 5957	.0176 6385	.0059 7129	.0018 7391	.0005 5180
1.00	.0691 0963	.0278 5602	.0103 0115	.0035 4029	.0011 4259
1.05	.0961 8190	.0420 8892	.0169 2807	.0063 3525	.0022 2840
1.10	.1294 3861	.0611 5713	.0266 0958	.0107 8750	.0041 1417
1.15	.1689 3358	.0857 3916	.0401 5690	.0175 4915	.0072 2222
1.20	.2143 7842	.1163 1316	.0583 6811	.0273 7234	.0121 0164
1.25	.2651 4296	.1530 8435	.0819 4767	.0410 6402	.0194 2228
1.30	.3202 8982	.1959 3535	.1114 2215	.0594 2062	.0299 4868
1.35	.3786 3856	.2444 0724	.1470 6389	.0831 4847	.0444 9229
1.40	.4388 5086	.2977 1454	.1888 3403	.1127 7947	.0638 4381
1.45	.4995 2625	.3547 9287	.2363 5396	.1485 9357	.0886 9204
1.50	.5592 9718	.4143 7289	.2889 1045	.1905 5968	.1195 3887
1.55	.6169 1376	.4750 7133	.3454 9432	.2383 0475	.1566 2239
1.60	.6713 1070	.5354 8812	.4048 6834	.2911 1652	.1998 5977
1.65	.7216 5203	.5942 9861	.4656 5550	.3479 8082	.2488 1965
1.70	.7673 5252	.6503 3201	.5264 3705	.4076 4906	.3027 2926
1.75	.8080 7726	.7026 2940	.5858 4882	.4687 2748	.3605 1680
1.80	.8437 2302	.7504 7824	.6426 6579	.5297 7726	.4208 8399
1.85	.8743 8633	.7934 2333	.6958 6726	.5894 1348	.4823 9989
1.90	.9003 2347	.8312 5680	.7446 7839	.6463 9251	.5436 0425
1.95	.9219 0737	.8639 9158	.7885 8710	.6996 7969	.6031 0829
2.00	.9395 8565	.8918 2363	.8273 3832	.7484 9248	.6596 8195
2.05	.9538 4293	.9150 8843	.8609 0981	.7923 1804	.7123 1975
2.10	.9651 6930	.9342 1660	.8894 7504	.8309 0724	.7602 8072
2.15	.9740 3601	.9496 9247	.9133 5882	.8642 4930	.8031 0174
2.20	.9808 7831	.9620 1844	.9329 9103	.8925 3301	.8405 8696
2.25	.9860 8485	.9716 8644	.9488 6282	.9161 0047	.8727 7817
2.30	.9899 9270	.9791 5706	.9614 8845	.9353 9899	.8999 1218
2.35	.9928 8665	.9848 4597	.9713 7439	.9509 3575	.9223 7184
2.40	.9950 0173	.9891 1660	.9789 9661	.9632 3852	.9406 3625
2.45	.9965 2773	.9922 7797	.9847 8548	.9728 2416	.9552 3488
2.50	.9976 1486	.9945 8632	.9891 1755	.9801 7568	.9667 0855

W_5	$P(W_5, .24)$	$P(W_5, .26)$	$P(W_5, .28)$	$P(W_5, .30)$	$P(W_5, .32)$
2.55	.9983 7976	.9962 4932	.9923 1295	.9857 2734	.9755 7905
2.60	.9989 1141	.9974 3170	.9946 3681	.9898 5693	.9823 2761
2.65	.9992 7653	.9982 6155	.9963 0356	.9928 8360	.9873 8176
2.70	.9995 2432	.9988 3663	.9974 8287	.9950 7001	.9911 0915
2.75	.9996 9055	.9992 3021	.9983 0623	.9966 2716	.9938 1698
2.80	.9998 0080	.9994 9628	.9988 7359	.9977 2082	.9957 5535
2.85	.9998 7309	.9996 7400	.9992 5956	.9984 7853	.9971 2301
2.90	.9999 1998	.9997 9130	.9995 1882	.9989 9650	.9980 7441
2.95	.9999 5005	.9998 6782	.9996 9083	.9993 4596	.9987 2711
3.00	.9999 6914	.9999 1717	.9998 0356	.9995 7869	.9991 6883
3.05	.9999 8112	.9999 4864	.9998 7656	.9997 3174	.9994 6380
3.10	.9999 8856	.9999 6848	.9999 2328	.9998 3113	.9996 5820
3.15	.9999 9314	.9999 8086	.9999 5282	.9998 9489	.9997 8467
3.20	.9999 9592	.9999 8849	.9999 7130	.9999 3530	.9998 6591
3.25	.9999 9760	.9999 9315	.9999 8272	.9999 6062	.9999 1746
3.30	.9999 9860	.9999 9596	.9999 8971	.9999 7628	.9999 4976
3.35	.9999 9919	.9999 9764	.9999 9393	.9999 8587	.9999 6976
3.40	.9999 9954	.9999 9864	.9999 9646	.9999 9167	.9999 8200
3.45	.9999 9974	.9999 9922	.9999 9795	.9999 9514	.9999 8940
3.50	.9999 9985	.9999 9956	.9999 9883	.9999 9720	.9999 9383
3.55	.9999 9992	.9999 9975	.9999 9934	.9999 9840	.9999 9644
3.60	.9999 9995	.9999 9986	.9999 9963	.9999 9909	.9999 9797
3.65	.9999 9998	.9999 9992	.9999 9979	.9999 9949	.9999 9885
3.70	.9999 9999	.9999 9996	.9999 9989	.9999 9972	.9999 9936
3.75	.9999 9999	.9999 9998	.9999 9994	.9999 9985	.9999 9965
3.80	1.0000 0000	.9999 9999	.9999 9997	.9999 9992	.9999 9981
3.85		.9999 9999	.9999 9998	.9999 9995	.9999 9989
3.90		1.0000 0000	.9999 9999	.9999 9998	.9999 9994
3.95			1.0000 0000	.9999 9999	.9999 9997
4.00				.9999 9999	.9999 9998
4.05				1.0000 0000	.9999 9999
4.10					1.0000 0000
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_5	$P(W_5, .34)$	$P(W_5, .36)$	$P(W_5, .38)$	$P(W_5, .40)$	$P(W_5, .50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50	.0000 0000				
0.55	.0000 0001				
0.60	.0000 0004	.0000 0000			
0.65	.0000 0018	.0000 0002	.0000 0000		
0.70	.0000 0073	.0000 0011	.0000 0002	.0000 0000	
0.75	.0000 0260	.0000 0045	.0000 0007	.0000 0001	
0.80	.0000 0828	.0000 0160	.0000 0030	.0000 0005	
0.85	.0000 2387	.0000 0517	.0000 0107	.0000 0021	
0.90	.0000 6303	.0000 1517	.0000 0350	.0000 0078	
0.95	.0001 5379	.0000 4085	.0000 1040	.0000 0255	.0000 0000
1.00	.0003 4922	.0001 0178	.0000 2845	.0000 0766	.0000 0001
1.05	.0007 4276	.0002 3619	.0000 7205	.0000 2119	.0000 0003
1.10	.0014 8788	.0005 1360	.0001 7015	.0000 5435	.0000 0012
1.15	.0028 2052	.0010 5196	.0003 7670	.0001 3010	.0000 0042
1.20	.0050 8122	.0020 3875	.0007 8575	.0002 9217	.0000 0136
1.25	.0087 3188	.0037 5377	.0015 5085	.0006 1840	.0000 0409
1.30	.0143 6139	.0065 8982	.0029 0753	.0012 3866	.0000 1146
1.35	.0226 7449	.0110 6575	.0051 9577	.0023 5665	.0000 2995
1.40	.0344 5970	.0178 2605	.0088 7769	.0042 7302	.0000 7341
1.45	.0505 3533	.0276 2155	.0145 4458	.0074 0587	.0001 6941
1.50	.0716 7665	.0412 6799	.0229 0731	.0123 0295	.0003 6939
1.55	.0985 3147	.0595 8316	.0347 6564	.0196 3930	.0007 6353
1.60	.1315 3475	.0833 0695	.0509 5458	.0301 9485	.0015 0057
1.65	.1708 3458	.1130 1355	.0722 7063	.0448 0903	.0028 1160
1.70	.2162 4133	.1490 2741	.0993 8472	.0643 1288	.0050 3525
1.75	.2672 0886	.1913 5578	.1327 5279	.0894 4428	.0086 3929
1.80	.3228 5216	.2396 4918	.1725 3689	.1207 5582	.0142 3244
1.85	.3820 0047	.2931 9734	.2185 4981	.1585 2828	.0225 5907
1.90	.4432 7925	.3509 6303	.2702 3298	.2027 0323	.0344 7070
1.95	.5052 1104	.4116 5033	.3266 7310	.2528 4662	.0508 7101
2.00	.5663 2236	.4737 9892	.3866 5685	.3081 5102	.0726 3569
2.05	.6252 4444	.5358 9241	.4487 5714	.3674 7815	.1005 1422
2.10	.6807 9695	.5964 6730	.5114 3995	.4294 3720	.1350 2569
2.15	.7320 4753	.6542 1031	.5731 7818	.4924 8908	.1763 6433
2.20	.7783 4367	.7080 3408	.6325 5882	.5550 6302	.2243 3094
2.25	.8193 1749	.7571 2554	.6883 7171	.6156 7099	.2783 0360
2.30	.8548 6692	.8009 6523	.7396 7188	.6730 0678	.3372 5521
2.35	.8851 1920	.8393 1964	.7858 1179	.7260 1981	.3998 1791
2.40	.9103 8337	.8722 1182	.8264 4413	.7739 5834	.4643 8655
2.45	.9310 9829	.8998 7670	.8614 9945	.8163 8135	.5292 4735
2.50	.9477 8199	.9227 0861	.8911 4500	.8531 4245	.5927 1416

W_5	$P(W_5, .34)$	$P(W_5, .36)$	$P(W_5, .38)$	$P(W_5, .40)$	$P(W_5, .50)$
2.55	.9609 8645	.9412 0725	.9157 3245	.8843 5205	.6532 5475
2.60	.9712 6065	.9559 2758	.9357 4165	.9103 2563	.7095 9233
2.65	.9791 2290	.9674 3728	.9517 2663	.9315 2578	.7607 7256
2.70	.9850 4231	.9762 8350	.9642 6826	.9485 0506	.8061 9244
2.75	.9894 2863	.9829 6952	.9739 3638	.9618 5483	.8455 9314
2.80	.9926 2870	.9879 4070	.9812 6214	.9721 6327	.8790 2330
2.85	.9949 2802	.9915 7807	.9867 2043	.9799 8424	.9067 8214
2.90	.9965 5566	.9941 9807	.9907 2093	.9858 1670	.9293 5222
2.95	.9976 9109	.9960 5649	.9936 0618	.9900 9368	.9473 3118
3.00	.9984 7190	.9973 5503	.9956 5457	.9931 7882	.9613 6962
3.05	.9990 0133	.9982 4908	.9970 8658	.9953 6871	.9721 1960
3.10	.9993 5541	.9988 5582	.9980 7269	.9968 9884	.9801 9637
3.15	.9995 8902	.9992 6177	.9987 4176	.9979 5161	.9861 5306
3.20	.9997 4112	.9995 2965	.9991 8919	.9986 6510	.9904 6727
3.25	.9998 3887	.9997 0401	.9994 8418	.9991 4154	.9935 3705
3.30	.9999 0088	.9998 1600	.9996 7597	.9994 5511	.9956 8390
3.35	.9999 3973	.9998 8699	.9997 9898	.9996 5857	.9971 6013
3.40	.9999 6377	.9999 3141	.9998 7681	.9997 8875	.9981 5859
3.45	.9999 7847	.9999 5885	.9999 2542	.9998 7093	.9988 2307
3.50	.9999 8735	.9999 7560	.9999 5538	.9999 2210	.9992 5835
3.55	.9999 9264	.9999 8570	.9999 7362	.9999 5355	.9995 3912
3.60	.9999 9577	.9999 9171	.9999 8458	.9999 7264	.9997 1749
3.65	.9999 9759	.9999 9525	.9999 9109	.9999 8407	.9998 2915
3.70	.9999 9865	.9999 9730	.9999 9491	.9999 9083	.9998 9804
3.75	.9999 9925	.9999 9849	.9999 9712	.9999 9478	.9999 3994
3.80	.9999 9958	.9999 9916	.9999 9839	.9999 9706	.9999 6507
3.85	.9999 9977	.9999 9954	.9999 9911	.9999 9837	.9999 7994
3.90	.9999 9988	.9999 9975	.9999 9951	.9999 9910	.9999 8862
3.95	.9999 9993	.9999 9987	.9999 9974	.9999 9951	.9999 9363
4.00	.9999 9997	.9999 9993	.9999 9986	.9999 9974	.9999 9647
4.05	.9999 9998	.9999 9996	.9999 9993	.9999 9986	.9999 9807
4.10	.9999 9999	.9999 9998	.9999 9996	.9999 9993	.9999 9896
4.15	1.0000 0000	.9999 9999	.9999 9998	.9999 9996	.9999 9944
4.20		.9999 9999	.9999 9999	.9999 9998	.9999 9970
4.25		1.0000 0000	.9999 9999	.9999 9999	.9999 9985
4.30			1.0000 0000	.9999 9999	.9999 9992
4.35				1.0000 0000	.9999 9996
4.40					.9999 9998
4.45					.9999 9999
4.50					.9999 9999
4.55					1.0000 0000
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_5	$P(W_5,60)$	$P(W_5,70)$	$P(W_5,80)$	$P(W_5,90)$	$P(W_5,100)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05					
1.10					
1.15					
1.20	.0000 0000				
1.25	.0000 0002				
1.30	.0000 0006				
1.35	.0000 0023	.0000 0000			
1.40	.0000 0077	.0000 0001			
1.45	.0000 0237	.0000 0002			
1.50	.0000 0683	.0000 0009			
1.55	.0000 1836	.0000 0032	.0000 0000		
1.60	.0000 4637	.0000 0103	.0000 0002		
1.65	.0001 1035	.0000 0313	.0000 0007	.0000 0000	
1.70	.0002 4819	.0000 0887	.0000 0025	.0000 0001	
1.75	.0005 2903	.0000 2357	.0000 0083	.0000 0002	
1.80	.0010 7162	.0000 5889	.0000 0257	.0000 0009	.0000 0000
1.85	.0020 6797	.0001 3888	.0000 0742	.0000 0033	.0000 0001
1.90	.0038 1060	.0003 0985	.0000 2007	.0000 0109	.0000 0005
1.95	.0067 1949	.0006 5572	.0000 5110	.0000 0335	.0000 0019
2.00	.0113 6237	.0013 1943	.0001 2265	.0000 0961	.0000 0066
2.05	.0184 6044	.0025 3009	.0002 7834	.0000 2584	.0000 0210
2.10	.0288 7146	.0046 3335	.0005 9860	.0000 6537	.0000 0625
2.15	.0435 4408	.0081 1987	.0012 2288	.0001 5595	.0000 1742
2.20	.0634 4185	.0136 4408	.0023 7827	.0003 5175	.0000 4563
2.25	.0894 4152	.0220 2390	.0044 1245	.0007 5174	.0001 1247
2.30	.1222 1696	.0342 1241	.0078 2547	.0015 2576	.0002 6164
2.35	.1621 2563	.0512 3585	.0132 9206	.0029 4720	.0005 7565
2.40	.2091 1674	.0740 9817	.0216 6388	.0054 2908	.0012 0067
2.45	.2626 7918	.1036 6016	.0339 4139	.0095 5644	.0023 7911
2.50	.3218 4134	.1405 0896	.0512 0841	.0161 0463	.0044 8793

W_5	$P(W_5,.60)$	$P(W_5,.70)$	$P(W_5,.80)$	$P(W_5,.90)$	$P(W_5,.100)$
2.55	.3852 2647	.1848 3908	.0745 2894	.0260 3159	.0080 7585
2.60	.4511 5768	.2363 6729	.1048 1498	.0404 3311	.0138 8969
2.65	.5177 9798	.2943 0012	.1426 8303	.0604 5578	.0228 7642
2.70	.5833 0530	.3573 6382	.1883 2330	.0871 7055	.0361 4820
2.75	.6459 8080	.4238 9595	.2414 0733	.1214 2101	.0549 0198
2.80	.7043 9178	.4919 8615	.3010 5519	.1636 6954	.0802 9388
2.85	.7574 5566	.5596 4527	.3658 7317	.2138 7020	.1132 8052
2.90	.8044 7946	.6249 7754	.4340 6028	.2713 9570	.1544 5071
2.95	.8451 5603	.6863 3186	.5035 6813	.3350 3803	.2038 7869
3.00	.8795 2457	.7424 1354	.5722 8965	.4030 8808	.2610 3051
3.05	.9079 0632	.7923 4618	.6382 4740	.4734 8479	.3247 4774
3.10	.9308 2765	.8356 8254	.6997 5456	.5440 1022	.3933 1813
3.15	.9489 4164	.8723 7103	.7555 2846	.6124 9926	.4646 2562
3.20	.9629 5698	.9026 8972	.8047 4684	.6770 3130	.5363 5570
3.25	.9735 7987	.9271 6218	.8470 4757	.7360 7752	.6062 2207
3.30	.9814 7129	.9464 6872	.8824 8109	.7885 8735	.6721 7793
3.35	.9872 1983	.9613 6421	.9114 3029	.8340 1056	.7325 8117
3.40	.9913 2812	.9726 0981	.9345 1445	.8722 6203	.7862 9400
3.45	.9942 0993	.9809 2234	.9524 9223	.9036 4428	.8327 1161
3.50	.9961 9496	.9869 4163	.9661 7525	.9287 4621	.8717 2719
3.55	.9975 3821	.9912 1378	.9763 5932	.9483 3591	.9036 4954
3.60	.9984 3154	.9941 8721	.9837 7610	.9632 6200	.9290 9397
3.65	.9990 1566	.9962 1767	.9890 6438	.9743 7296	.9488 6637
3.70	.9993 9134	.9975 7868	.9927 5811	.9824 5881	.9638 5673
3.75	.9996 2909	.9984 7458	.9952 8681	.9882 1504	.9749 5251
3.80	.9997 7718	.9990 5399	.9969 8445	.9922 2602	.9829 7653
3.85	.9998 6801	.9994 2231	.9981 0267	.9949 6329	.9886 4938
3.90	.9999 2289	.9996 5252	.9988 2568	.9967 9385	.9925 7278
3.95	.9999 5555	.9997 9408	.9992 8479	.9979 9413	.9952 2888
4.00	.9999 7472	.9998 7973	.9995 7124	.9987 6618	.9969 9006
4.05	.9999 8581	.9999 3076	.9997 4691	.9992 5358	.9981 3450
4.10	.9999 9214	.9999 6069	.9998 5285	.9995 5574	.9988 6369
4.15	.9999 9570	.9999 7799	.9999 1571	.9997 3976	.9993 1952
4.20	.9999 9767	.9999 8784	.9999 5242	.9998 4992	.9995 9922
4.25	.9999 9876	.9999 9337	.9999 7352	.9999 1476	.9997 6776
4.30	.9999 9934	.9999 9643	.9999 8547	.9999 5231	.9998 6755
4.35	.9999 9966	.9999 9810	.9999 9213	.9999 7370	.9999 2563
4.40	.9999 9982	.9999 9900	.9999 9580	.9999 8571	.9999 5887
4.45	.9999 9991	.9999 9948	.9999 9778	.9999 9234	.9999 7759
4.50	.9999 9995	.9999 9974	.9999 9885	.9999 9595	.9999 8797
4.55	.9999 9998	.9999 9987	.9999 9941	.9999 9789	.9999 9363
4.60	.9999 9999	.9999 9993	.9999 9970	.9999 9891	.9999 9667
4.65	.9999 9999	.9999 9997	.9999 9985	.9999 9945	.9999 9829
4.70	1.0000 0000	.9999 9998	.9999 9993	.9999 9972	.9999 9913
4.75		.9999 9999	.9999 9996	.9999 9986	.9999 9956
4.80		1.0000 0000	.9999 9998	.9999 9993	.9999 9978
4.85			.9999 9999	.9999 9997	.9999 9989
4.90			1.0000 0000	.9999 9998	.9999 9995
4.95				.9999 9999	.9999 9998
5.00				1.0000 0000	.9999 9999

W_5	$P(W_5,60)$	$P(W_5,70)$	$P(W_5,80)$	$P(W_5,90)$	$P(W_5,100)$
5.05					.9999 9999
5.10					1.0000 0000
5.15					
5.20					
5.25					
5.30					
5.35					
5.40					
5.45					
5.50					
5.55					
5.60					
5.65					
5.70					
5.75					
5.80					
5.85					
5.90					
5.95					
6.00					
6.05					
6.10					
6.15					
6.20					
6.25					
6.30					
6.35					
6.40					
6.45					
6.50					
6.55					
6.60					
6.65					
6.70					
6.75					
6.80					
6.85					
6.90					
6.95					
7.00					
7.05					
7.10					
7.15					
7.20					
7.25					
7.30					
7.35					
7.40					
7.45					
7.50					

W_6	$P(W_6,12)$	$P(W_6,13)$	$P(W_6,14)$	$P(W_6,15)$	$P(W_6,16)$
0.05			.2344 0808	.0320 0875	.0031 8749
0.10			.4172 1427	.1090 0696	.0212 2079
0.15			.5589 2295	.2090 2301	.0595 4428
0.20			.6681 1006	.3171 3337	.1172 7353
0.25			.7517 2778	.4236 6987	.1902 7417
0.30			.8153 7214	.5227 9433	.2731 8413
0.35			.8635 1581	.6113 8472	.3606 5601
0.40			.8997 0837	.6881 8095	.4480 4394
0.45			.9267 4694	.7531 4304	.5317 1101
0.50			.9468 2011	.8069 8014	.6090 9215
0.55			.9616 2825	.8508 1416	.6786 1167
0.60			.9724 8302	.8859 4760	.7395 2605
0.65			.9803 8910	.9137 1014	.7917 3954
0.70			.9861 1056	.9353 6335	.8356 2276
0.75			.9902 2435	.9520 4718	.8718 5141
0.80			.9931 6303	.9647 5544	.9012 7318
0.85			.9952 4860	.9743 3044	.9248 0491
0.90			.9967 1901	.9814 6972	.9433 5824
0.95			.9977 4888	.9867 3956	.9577 8988
1.00			.9984 6544	.9905 9173	.9688 7198
1.05			.9989 6068	.9933 8100	.9772 7788
1.10			.9993 0068	.9953 8201	.9835 7884
1.15			.9995 3253	.9968 0457	.9882 4833
1.20			.9996 8957	.9978 0691	.9916 7065
1.25			.9997 9522	.9985 0698	.9941 5205
1.30			.9998 6581	.9989 9172	.9959 3241
1.35			.9999 1265	.9993 2450	.9971 9675
1.40			.9999 4353	.9995 5104	.9980 8562
1.45			.9999 6373	.9997 0395	.9987 0439
1.50			.9999 7687	.9998 0632	.9991 3096
1.55			.9999 8534	.9998 7428	.9994 2222
1.60			.9999 9078	.9999 1903	.9996 1923
1.65			.9999 9424	.9999 4826	.9997 5124
1.70			.9999 9642	.9999 6719	.9998 3889
1.75			.9999 9780	.9999 7936	.9998 9655
1.80			.9999 9865	.9999 8711	.9999 3414
1.85			.9999 9918	.9999 9202	.9999 5843
1.90			.9999 9951	.9999 9509	.9999 7398
1.95			.9999 9970	.9999 9701	.9999 8385
2.00			.9999 9982	.9999 9819	.9999 9006
2.05			.9999 9990	.9999 9891	.9999 9393
2.10			.9999 9994	.9999 9935	.9999 9633
2.15			.9999 9996	.9999 9962	.9999 9780
2.20			.9999 9998	.9999 9978	.9999 9869
2.25			.9999 9999	.9999 9987	.9999 9923
2.30			.9999 9999	.9999 9992	.9999 9955
2.35			1.0000 0000	.9999 9996	.9999 9974
2.40				.9999 9998	.9999 9985
2.45				.9999 9999	.9999 9991
2.50				.9999 9999	.9999 9995

W_6	$P(W_6,12)$	$P(W_6,13)$	$P(W_6,14)$	$P(W_6,15)$	$P(W_6,16)$
2.55				1.0000 0000	.9999 9997
2.60					.9999 9998
2.65					.9999 9999
2.70					1.0000 0000
2.75					
2.80					
2.85					
2.90					
2.95					
3.00					
3.05					
3.10					
3.15					
3.20					
3.25					
3.30					
3.35					
3.40					
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_6	$P(W_6, 17)$	$P(W_6, 18)$	$P(W_6, 19)$	$P(W_6, 20)$	$P(W_6, 22)$
0.05	.0002 5603	.0000 1755	.0000 0106	.0000 0006	.0000 0000
0.10	.0033 6229	.0004 5667	.0000 5498	.0000 0601	.0000 0006
0.15	.0139 3862	.0028 1083	.0005 0389	.0000 8209	.0000 0174
0.20	.0360 0085	.0095 7130	.0022 6910	.0004 8983	.0000 1827
0.25	.0717 0418	.0235 3622	.0069 1201	.0018 5224	.0001 0687
0.30	.1211 3266	.0470 7065	.0164 2419	.0052 4123	.0004 3059
0.35	.1826 4099	.0815 8526	.0328 5200	.0121 2835	.0013 3951
0.40	.2534 2104	.1273 0934	.0578 9369	.0242 0226	.0034 4409
0.45	.3300 9211	.1833 2678	.0925 7895	.0431 0310	.0076 4812
0.50	.4092 0509	.2477 9672	.1370 9153	.0701 4348	.0151 1723
0.55	.4876 1390	.3182 7066	.1907 4788	.1060 7985	.0271 7630
0.60	.5627 0749	.3920 3017	.2521 0887	.1509 7718	.0451 5013
0.65	.6325 1849	.4663 8958	.3191 8217	.2041 8345	.0701 7654
0.70	.6957 3563	.5389 3156	.3896 6721	.2644 0587	.1030 2852
0.75	.7516 4919	.6076 6279	.4611 9942	.3298 6396	.1439 7889
0.80	.8000 5679	.6710 9192	.5315 6121	.3984 8611	.1927 3116
0.85	.8411 5171	.7282 4173	.5988 4029	.4681 1565	.2484 2552
0.90	.8754 1018	.7786 1167	.6615 2796	.5366 9801	.3097 1517
0.95	.9034 8870	.8221 0843	.7185 5984	.6024 2924	.3748 9658
1.00	.9261 3742	.8589 6015	.7693 0823	.6638 5571	.4420 7050
1.05	.9441 3218	.8896 2714	.8135 3858	.7199 2368	.5093 0950
1.10	.9582 2501	.9147 1840	.8513 4328	.7699 8385	.5748 1006
1.15	.9691 1106	.9349 1962	.8830 6519	.8137 6054	.6370 1352
1.20	.9774 0954	.9509 3562	.9092 2055	.8512 9658	.6946 8690
1.25	.9836 5532	.9634 4767	.9304 2850	.8828 8514	.7469 6170
1.30	.9882 9849	.9730 8473	.9473 5160	.9089 9818	.7933 3443
1.35	.9917 0915	.9804 0648	.9606 4927	.9302 1882	.8336 3637
1.40	.9941 8542	.9858 9595	.9709 4425	.9471 8262	.8679 8212
1.45	.9959 6296	.9899 5909	.9788 0100	.9605 3045	.8967 0668
1.50	.9972 2482	.9929 2908	.9847 1417	.9708 7360	.9202 9950
1.55	.9981 1089	.9950 7370	.9891 0483	.9787 7055	.9393 4247
1.60	.9987 2647	.9966 0396	.9923 2238	.9847 1371	.9544 5623
1.65	.9991 4966	.9976 8319	.9946 5020	.9891 2431	.9662 5740
1.70	.9994 3759	.9984 3567	.9963 1333	.9923 5323	.9753 2730
1.75	.9996 3152	.9989 5446	.9974 8708	.9946 8581	.9821 9161
1.80	.9997 6082	.9993 0821	.9983 0555	.9963 4908	.9873 0942
1.85	.9998 4618	.9995 4682	.9988 6958	.9975 2008	.9910 6976
1.90	.9999 0198	.9997 0605	.9992 5378	.9983 3427	.9937 9354
1.95	.9999 3811	.9998 1120	.9995 1252	.9988 9348	.9957 3917
2.00	.9999 6127	.9998 7990	.9996 8482	.9992 7296	.9971 1011
2.05	.9999 7598	.9999 2434	.9997 9830	.9995 2745	.9980 6326
2.10	.9999 8524	.9999 5279	.9998 7223	.9996 9613	.9987 1729
2.15	.9999 9101	.9999 7082	.9999 1987	.9998 0666	.9991 6032
2.20	.9999 9457	.9999 8213	.9999 5024	.9998 7828	.9994 5665
2.25	.9999 9675	.9999 8916	.9999 6941	.9999 2416	.9996 5240
2.30	.9999 9807	.9999 9349	.9999 8138	.9999 5323	.9997 8012
2.35	.9999 9887	.9999 9612	.9999 8877	.9999 7145	.9998 6246
2.40	.9999 9934	.9999 9771	.9999 9330	.9999 8275	.9999 1491
2.45	.9999 9962	.9999 9866	.9999 9604	.9999 8968	.9999 4794
2.50	.9999 9978	.9999 9923	.9999 9768	.9999 9389	.9999 6849

W_6	$P(W_6, 17)$	$P(W_6, 18)$	$P(W_6, 19)$	$P(W_6, 20)$	$P(W_6, 22)$
2.55	.9999 9988	.9999 9956	.9999 9865	.9999 9642	.9999 8113
2.60	.9999 9993	.9999 9975	.9999 9923	.9999 9792	.9999 8882
2.65	.9999 9996	.9999 9986	.9999 9956	.9999 9880	.9999 9345
2.70	.9999 9998	.9999 9992	.9999 9975	.9999 9932	.9999 9620
2.75	.9999 9999	.9999 9996	.9999 9986	.9999 9962	.9999 9782
2.80	.9999 9999	.9999 9998	.9999 9992	.9999 9979	.9999 9876
2.85	1.0000 0000	.9999 9999	.9999 9996	.9999 9988	.9999 9930
2.90		.9999 9999	.9999 9998	.9999 9993	.9999 9961
2.95		1.0000 0000	.9999 9999	.9999 9996	.9999 9979
3.00			.9999 9999	.9999 9998	.9999 9988
3.05			1.0000 0000	.9999 9999	.9999 9994
3.10				.9999 9999	.9999 9997
3.15				1.0000 0000	.9999 9998
3.20					.9999 9999
3.25					1.0000 0000
3.30					
3.35					
3.40					
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_6	$P(W_6 \cdot 24)$	$P(W_6 \cdot 26)$	$P(W_6 \cdot 28)$	$P(W_6 \cdot 30)$	$P(W_6 \cdot 32)$
0.05					
0.10	.0000 0000				
0.15	.0000 0003	.0000 0000			
0.20	.0000 0054	.0000 0001	.0000 0000		
0.25	.0000 0491	.0000 0019	.0000 0001		
0.30	.0000 2828	.0000 0156	.0000 0008	.0000 0000	
0.35	.0001 1867	.0000 0887	.0000 0058	.0000 0003	.0000 0000
0.40	.0003 9459	.0000 3821	.0000 0324	.0000 0025	.0000 0002
0.45	.0010 9703	.0001 3331	.0000 1419	.0000 0135	.0000 0012
0.50	.0026 4541	.0003 9317	.0000 5125	.0000 0600	.0000 0064
0.55	.0056 8027	.0010 1106	.0001 5809	.0000 2222	.0000 0286
0.60	.0110 7370	.0023 1968	.0004 2760	.0000 7093	.0000 1077
0.65	.0198 9323	.0048 3175	.0010 3472	.0001 9965	.0000 3529
0.70	.0333 1517	.0092 6231	.0022 7527	.0005 0427	.0001 0248
0.75	.0524 9601	.0165 1905	.0046 0341	.0011 5914	.0002 6790
0.80	.0784 2130	.0276 5197	.0086 5650	.0024 5258	.0006 3851
0.85	.1117 5815	.0437 6217	.0152 5557	.0048 2158	.0014 0195
0.90	.1527 3758	.0658 7911	.0253 7168	.0088 7602	.0028 6045
0.95	.2010 8759	.0948 2426	.0400 5475	.0154 0168	.0054 6319
1.00	.2560 2783	.1310 8357	.0603 2921	.0253 3259	.0098 2811
1.05	.3163 2564	.1747 1096	.0870 6926	.0396 8829	.0167 4301
1.10	.3804 0307	.2252 8005	.1208 7260	.0594 7834	.0271 3720
1.15	.4464 7707	.2818 9263	.1619 5371	.0855 8440	.0420 1908
1.20	.5127 1196	.3432 4250	.2100 7564	.1186 3677	.0623 8213
1.25	.5773 6393	.4077 2445	.2645 3281	.1589 0521	.0890 8892
1.30	.6389 0132	.4735 7145	.3241 8873	.2062 2347	.1227 4930
1.35	.6960 9007	.5390 0059	.3875 6317	.2599 6142	.1636 1259
1.40	.7480 4033	.6023 4887	.4529 5561	.3190 5117	.2114 9252
1.45	.7942 1558	.6621 8391	.5185 8702	.3820 6401	.2657 3951
1.50	.8344 1033	.7173 7997	.5827 4077	.4473 2705	.3252 6673
1.55	.8687 0473	.7671 5603	.6438 8556	.5130 6266	.3886 2737
1.60	.8974 0540	.8110 7788	.7007 6794	.5775 3137	.4541 3218
1.65	.9209 8126	.8490 3038	.7524 6778	.6391 6028	.5199 9023
1.70	.9400 0149	.8811 6853	.7984 1614	.6966 4318	.5844 5359
1.75	.9550 8072	.9078 5649	.8383 7970	.7490 0392	.6459 4722
1.80	.9668 3460	.9296 0320	.8724 1956	.7956 2137	.7031 7005
1.85	.9758 4668	.9470 0134	.9008 3347	.8362 1893	.7551 5850
1.90	.9826 4657	.9606 7459	.9240 9096	.8708 2631	.8013 1050
1.95	.9876 9764	.9712 3577	.9427 6898	.8997 2242	.8413 7338
2.00	.9913 9281	.9792 5661	.9574 9435	.9233 6948	.8754 0331
2.05	.9940 5600	.9852 4868	.9688 9639	.9423 4650	.9037 0583
2.10	.9959 4759	.9896 5375	.9775 7160	.9572 8895	.9267 6768
2.15	.9972 7206	.9928 4168	.9840 6012	.9688 3871	.9451 8857
2.20	.9981 8653	.9951 1357	.9888 3269	.9776 0636	.9596 1977
2.25	.9988 0928	.9967 0848	.9922 8625	.9841 4580	.9707 1363
2.30	.9992 2769	.9978 1174	.9947 4572	.9889 4008	.9790 8608
2.35	.9995 0509	.9985 6395	.9964 7005	.9923 9627	.9852 9193
2.40	.9996 8663	.9990 6958	.9976 6060	.9948 4715	.9898 1160
2.45	.9998 0390	.9994 0476	.9984 7033	.9965 5735	.9930 4709
2.50	.9998 7872	.9996 2393	.9990 1299	.9977 3201	.9953 2460

W_6	$P(W_6 \cdot 24)$	$P(W_6 \cdot 26)$	$P(W_6 \cdot 28)$	$P(W_6 \cdot 30)$	$P(W_6 \cdot 32)$
2.55	.9999 2585	.9997 6532	.9993 7144	.9985 2643	.9969 0155
2.60	.9999 5518	.9998 5533	.9996 0487	.9990 5560	.9979 7593
2.65	.9999 7322	.9999 1188	.9997 5477	.9994 0286	.9986 9641
2.70	.9999 8417	.9999 4697	.9998 4972	.9996 2744	.9991 7211
2.75	.9999 9075	.9999 6846	.9999 0905	.9997 7060	.9994 8144
2.80	.9999 9465	.9999 8146	.9999 4563	.9998 6057	.9996 7960
2.85	.9999 9694	.9999 8923	.9999 6789	.9999 1634	.9998 0469
2.90	.9999 9827	.9999 9381	.9999 8127	.9999 5044	.9998 8251
2.95	.9999 9903	.9999 9648	.9999 8920	.9999 7100	.9999 3025
3.00	.9999 9946	.9999 9803	.9999 9385	.9999 8324	.9999 5912
3.05	.9999 9971	.9999 9890	.9999 9654	.9999 9043	.9999 7635
3.10	.9999 9984	.9999 9940	.9999 9807	.9999 9461	.9999 8649
3.15	.9999 9991	.9999 9967	.9999 9894	.9999 9699	.9999 9238
3.20	.9999 9995	.9999 9982	.9999 9942	.9999 9834	.9999 9575
3.25	.9999 9998	.9999 9991	.9999 9969	.9999 9910	.9999 9766
3.30	.9999 9999	.9999 9995	.9999 9983	.9999 9952	.9999 9873
3.35	.9999 9999	.9999 9997	.9999 9991	.9999 9974	.9999 9932
3.40	1.0000 0000	.9999 9999	.9999 9995	.9999 9986	.9999 9964
3.45		.9999 9999	.9999 9998	.9999 9993	.9999 9981
3.50		1.0000 0000	.9999 9999	.9999 9996	.9999 9990
3.55			.9999 9999	.9999 9998	.9999 9995
3.60			1.0000 0000	.9999 9999	.9999 9997
3.65				1.0000 0000	.9999 9999
3.70					.9999 9999
3.75					1.0000 0000
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_6	$P(W_6 \cdot 34)$	$P(W_6 \cdot 36)$	$P(W_6 \cdot 38)$	$P(W_6 \cdot 40)$	$P(W_6 \cdot 50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40	.0000 0000				
0.45	.0000 0001	.0000 0000			
0.50	.0000 0006	.0000 0001			
0.55	.0000 0034	.0000 0004	.0000 0000		
0.60	.0000 0152	.0000 0020	.0000 0002	.0000 0000	
0.65	.0000 0579	.0000 0089	.0000 0013	.0000 0002	
0.70	.0000 1934	.0000 0343	.0000 0057	.0000 0009	
0.75	.0000 5755	.0000 1160	.0000 0221	.0000 0040	
0.80	.0001 5461	.0000 3516	.0000 0757	.0000 0155	
0.85	.0003 7945	.0000 9652	.0000 2325	.0000 0534	.0000 0000
0.90	.0008 5888	.0002 4252	.0000 6489	.0000 1656	.0000 0001
0.95	.0018 0734	.0005 6267	.0001 6608	.0000 4677	.0000 0005
1.00	.0035 5999	.0012 1449	.0003 9305	.0001 2140	.0000 0020
1.05	.0066 0252	.0024 5428	.0008 6601	.0002 9179	.0000 0074
1.10	.0115 8886	.0046 6942	.0017 8720	.0006 5352	.0000 0250
1.15	.0193 3678	.0084 0455	.0034 7267	.0013 7164	.0000 0775
1.20	.0307 9350	.0143 7270	.0063 8260	.0027 1119	.0000 2216
1.25	.0469 6775	.0234 4171	.0111 4178	.0050 6900	.0000 5875
1.30	.0688 3158	.0365 8908	.0185 4062	.0089 9969	.0001 4519
1.35	.0972 0259	.0548 2371	.0295 0810	.0152 2665	.0003 3595
1.40	.1326 2338	.0790 7974	.0450 5154	.0246 2849	.0007 3099
1.45	.1752 5787	.1100 9538	.0661 6433	.0381 9378	.0015 0134
1.50	.2248 2334	.1482 9470	.0937 1027	.0569 4198	.0029 2062
1.55	.2805 7158	.1936 9253	.1282 9987	.0818 1559	.0053 9848
1.60	.3413 2464	.2458 4032	.1701 7848	.1135 5616	.0095 0886
1.65	.4055 6130	.3038 2465	.2191 4616	.1525 8259	.0160 0350
1.70	.4715 4189	.3663 2100	.2745 2550	.1988 9270	.0258 0000
1.75	.5374 5371	.4316 9631	.3351 8553	.2520 0703	.0399 3591
1.80	.6015 5686	.4981 4542	.3996 2049	.3109 6737	.0594 8553
1.85	.6623 1207	.5638 4200	.4660 7269	.3743 9345	.0854 4363
1.90	.7184 7673	.6270 8341	.5326 8157	.4405 9089	.1185 8953
1.95	.7691 6144	.6864 1157	.5976 3803	.5076 9496	.1593 5202
2.00	.8138 4607	.7406 9762	.6593 2329	.5738 2921	.2076 9921
2.05	.8523 5993	.7891 8468	.7164 1634	.6372 5706	.2630 7574
2.10	.8848 3448	.8314 8980	.7679 6024	.6965 0703	.3244 0275
2.15	.9116 3893	.8675 7160	.8133 8472	.7504 5880	.3901 4478
2.20	.9333 0910	.8976 7334	.8524 8929	.7983 8414	.4584 3573
2.25	.9504 7821	.9222 5245	.8853 9550	.8399 4447	.5272 4508
2.30	.9638 1609	.9419 0685	.9124 7944	.8751 5247	.5945 5928
2.35	.9739 8073	.9573 0631	.9342 9593	.9043 0858	.6585 5163
2.40	.9815 8332	.9691 3465	.9515 0425	.9279 2458	.7177 1841
2.45	.9871 6655	.9780 4560	.9648 0270	.9466 4517	.7709 6640
2.50	.9911 9412	.9846 3283	.9748 7640	.9611 7647	.8176 4665

W_6	$P(W_6, .34)$	$P(W_6, .36)$	$P(W_6, .38)$	$P(W_6, .40)$	$P(W_6, .50)$
2.55	.9940 4909	.9894 1307	.9823 5996	.9722 2705	.8575 3813
2.60	.9960 3851	.9928 1982	.9878 1444	.9804 6412	.8907 9198
2.65	.9974 0174	.9952 0514	.9917 1667	.9864 8515	.9178 5037
2.70	.9983 2065	.9968 4660	.9944 5799	.9908 0305	.9393 5494
2.75	.9989 3017	.9979 5717	.9963 4976	.9938 4227	.9560 5762
2.80	.9993 2812	.9986 9617	.9976 3267	.9959 4272	.9687 4335
2.85	.9995 8395	.9991 7996	.9984 8794	.9973 6865	.9781 6997
2.90	.9997 4592	.9994 9165	.9990 4865	.9983 1985	.9850 2695
2.95	.9998 4695	.9996 8934	.9994 1025	.9989 4359	.9899 1196
3.00	.9999 0905	.9998 1281	.9996 3972	.9993 4577	.9933 2200
3.05	.9999 4667	.9998 8877	.9997 8306	.9996 0085	.9956 5556
3.10	.9999 6914	.9999 3480	.9998 7122	.9997 6004	.9972 2171
3.15	.9999 8237	.9999 6230	.9999 2461	.9998 5783	.9982 5303
3.20	.9999 9006	.9999 7849	.9999 5648	.9999 1696	.9989 1964
3.25	.9999 9446	.9999 8789	.9999 7522	.9999 5218	.9993 4274
3.30	.9999 9696	.9999 9327	.9999 8607	.9999 7284	.9996 0654
3.35	.9999 9835	.9999 9630	.9999 9228	.9999 8479	.9997 6817
3.40	.9999 9911	.9999 9800	.9999 9577	.9999 9159	.9998 6552
3.45	.9999 9953	.9999 9893	.9999 9772	.9999 9542	.9999 2318
3.50	.9999 9975	.9999 9943	.9999 9878	.9999 9753	.9999 5678
3.55	.9999 9987	.9999 9970	.9999 9936	.9999 9869	.9999 7604
3.60	.9999 9993	.9999 9985	.9999 9967	.9999 9931	.9999 8691
3.65	.9999 9997	.9999 9992	.9999 9983	.9999 9964	.9999 9295
3.70	.9999 9998	.9999 9996	.9999 9991	.9999 9982	.9999 9626
3.75	.9999 9999	.9999 9998	.9999 9996	.9999 9991	.9999 9804
3.80	1.0000 0000	.9999 9999	.9999 9998	.9999 9995	.9999 9899
3.85		1.0000 0000	.9999 9999	.9999 9998	.9999 9949
3.90			.9999 9999	.9999 9999	.9999 9974
3.95			1.0000 0000	.9999 9999	.9999 9987
4.00				1.0000 0000	.9999 9994
4.05					.9999 9997
4.10					.9999 9999
4.15					.9999 9999
4.20					1.0000 0000
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_6	$P(W_6 \cdot 60)$	$P(W_6 \cdot 70)$	$P(W_6 \cdot 80)$	$P(W_6 \cdot 90)$	$P(W_6 \cdot 100)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95					
1.00					
1.05	.0000 0000				
1.10	.0000 0001				
1.15	.0000 0002				
1.20	.0000 0010				
1.25	.0000 0036	.0000 0000			
1.30	.0000 0126	.0000 0001			
1.35	.0000 0402	.0000 0003			
1.40	.0000 1184	.0000 0013			
1.45	.0000 3243	.0000 0047	.0000 0000		
1.50	.0000 8297	.0000 0157	.0000 0002		
1.55	.0001 9899	.0000 0491	.0000 0009	.0000 0000	
1.60	.0004 4900	.0000 1425	.0000 0034	.0000 0001	
1.65	.0009 5631	.0000 3858	.0000 0117	.0000 0003	
1.70	.0019 2842	.0000 9776	.0000 0373	.0000 0011	.0000 0000
1.75	.0036 9214	.0002 3271	.0000 1107	.0000 0042	.0000 0001
1.80	.0067 2929	.0005 2194	.0000 3063	.0000 0145	.0000 0006
1.85	.0117 0428	.0011 0614	.0000 7933	.0000 0460	.0000 0023
1.90	.0194 7228	.0022 2109	.0001 9289	.0000 1358	.0000 0081
1.95	.0310 5597	.0042 3635	.0004 4162	.0000 3740	.0000 0269
2.00	.0475 8248	.0076 9355	.0009 5451	.0000 9643	.0000 0828
2.05	.0701 7862	.0133 3407	.0019 5275	.0002 3345	.0000 2374
2.10	.0998 3249	.0221 0280	.0037 9053	.0005 3209	.0000 6365
2.15	.1372 3963	.0351 1485	.0069 9768	.0011 4485	.0001 5990
2.20	.1826 5967	.0535 7653	.0123 1338	.0023 3102	.0003 7746
2.25	.2358 1155	.0786 6028	.0206 9680	.0045 0198	.0008 3947
2.30	.2958 3131	.1113 4552	.0332 9931	.0082 6618	.0017 6325
2.35	.3613 0562	.1522 4846	.0513 8697	.0144 6106	.0035 0621
2.40	.4303 8031	.2014 7215	.0762 1107	.0241 5522	.0066 1561
2.45	.5009 2810	.2585 0879	.1088 3763	.0386 0445	.0118 7065
2.50	.5707 4924	.3222 1907	.1499 6059	.0591 5087	.0202 9968

W_6	$P(W_6,60)$	$P(W_6,70)$	$P(W_6,80)$	$P(W_6,90)$	$P(W_6,100)$
2.55	.6377 7337	.3908 9924	.1997 3329	.0870 6680	.0331 5362
2.60	.7002 3285	.4624 2889	.2576 5523	.1233 6013	.0518 2045
2.65	.7567 8550	.5344 7639	.3225 4340	.1685 7349	.0776 7675
2.70	.8065 7557	.6047 2774	.3926 0179	.2226 1780	.1118 8876
2.75	.8492 3352	.6711 0197	.4655 8227	.2846 8036	.1551 9330
2.80	.8848 2470	.7319 2133	.5390 1074	.3532 3475	.2077 0192
2.85	.9137 6313	.7860 1596	.6104 3950	.4261 5937	.2687 7428
2.90	.9367 0817	.8327 5646	.6776 8368	.5009 4757	.3369 9671
2.95	.9544 6088	.8720 2112	.7390 0539	.5749 7272	.4102 8039
3.00	.9678 7219	.9041 1404	.7932 2306	.6457 6109	.4860 6729
3.05	.9777 7063	.9296 5465	.8397 3975	.7112 2663	.5616 0730
3.10	.9849 1230	.9494 5956	.8784 9924	.7698 3338	.6342 5588
3.15	.9899 5208	.9644 3319	.9098 8954	.8206 6885	.7017 3948
3.20	.9934 3248	.9754 7845	.9346 1790	.8634 3065	.7623 4718
3.25	.9957 8578	.9834 3257	.9535 8056	.8983 4366	.8150 2619
3.30	.9973 4451	.9890 2805	.9677 4562	.9260 3345	.8593 8038
3.35	.9983 5635	.9928 7543	.9780 6022	.9473 8350	.8955 8896
3.40	.9990 0038	.9954 6256	.9853 8661	.9633 9972	.9242 7348
3.45	.9994 0249	.9971 6487	.9904 6601	.9750 9808	.9463 4382
3.50	.9996 4887	.9982 6146	.9939 0544	.9834 2352	.9628 5013
3.55	.9997 9707	.9989 5340	.9961 8146	.9892 0057	.9748 5928
3.60	.9998 8464	.9993 8126	.9976 5421	.9931 1181	.9833 6530
3.65	.9999 3547	.9996 4066	.9985 8659	.9956 9711	.9892 3494
3.70	.9999 6447	.9997 9493	.9991 6443	.9973 6656	.9931 8385
3.75	.9999 8074	.9998 8496	.9995 1516	.9984 2036	.9957 7576
3.80	.9999 8972	.9999 3654	.9997 2378	.9990 7097	.9974 3661
3.85	.9999 9459	.9999 6557	.9998 4544	.9994 6408	.9984 7626
3.90	.9999 9720	.9999 8162	.9999 1502	.9996 9666	.9991 1241
3.95	.9999 9857	.9999 9034	.9999 5408	.9998 3146	.9994 9313
4.00	.9999 9928	.9999 9501	.9999 7560	.9999 0805	.9997 1612
4.05	.9999 9964	.9999 9746	.9999 8725	.9999 5072	.9998 4400
4.10	.9999 9983	.9999 9872	.9999 9345	.9999 7405	.9999 1586
4.15	.9999 9992	.9999 9937	.9999 9668	.9999 8656	.9999 5544
4.20	.9999 9996	.9999 9969	.9999 9835	.9999 9316	.9999 7682
4.25	.9999 9998	.9999 9985	.9999 9919	.9999 9657	.9999 8815
4.30	.9999 9999	.9999 9993	.9999 9961	.9999 9831	.9999 9404
4.35	1.0000 0000	.9999 9997	.9999 9981	.9999 9918	.9999 9706
4.40		.9999 9998	.9999 9991	.9999 9961	.9999 9857
4.45		.9999 9999	.9999 9996	.9999 9982	.9999 9932
4.50		1.0000 0000	.9999 9998	.9999 9991	.9999 9968
4.55			.9999 9999	.9999 9996	.9999 9985
4.60			1.0000 0000	.9999 9998	.9999 9993
4.65				.9999 9999	.9999 9997
4.70				1.0000 0000	.9999 9999
4.75					.9999 9999
4.80					1.0000 0000
4.85					
4.90					
4.95					
5.00					

W_7	$P(W_7,12)$	$P(W_7,13)$	$P(W_7,14)$	$P(W_7,15)$	$P(W_7,16)$
0.05					.2645 8407
0.10					.4626 8327
0.15					.6099 9612
0.20					.7187 9309
0.25					.7985 9088
0.30					.8567 1317
0.35					.8987 5219
0.40					.9289 4481
0.45					.9504 7600
0.50					.9657 2129
0.55					.9764 3857
0.60					.9839 1848
0.65					.9891 0114
0.70					.9926 6595
0.75					.9951 0000
0.80					.9967 4973
0.85					.9978 5961
0.90					.9986 0073
0.95					.9990 9191
1.00					.9994 1501
1.05					.9996 2593
1.10					.9997 6258
1.15					.9998 5044
1.20					.9999 0649
1.25					.9999 4197
1.30					.9999 6427
1.35					.9999 7816
1.40					.9999 8676
1.45					.9999 9203
1.50					.9999 9524
1.55					.9999 9718
1.60					.9999 9834
1.65					.9999 9903
1.70					.9999 9944
1.75					.9999 9968
1.80					.9999 9982
1.85					.9999 9990
1.90					.9999 9994
1.95					.9999 9997
2.00					.9999 9998
2.05					.9999 9999
2.10					.9999 9999
2.15					1.0000 0000
2.20					
2.25					
2.30					
2.35					
2.40					
2.45					
2.50					

W_7	$P(W_7,17)$	$P(W_7,18)$	$P(W_7,19)$	$P(W_7,20)$	$P(W_7,22)$
0.05	.0408 8674	.0045 8542	.0004 1238	.0000 3147	.0000 0013
0.10	.1357 5630	.0296 4257	.0052 4563	.0007 9188	.0000 1268
0.15	.2540 7410	.0808 1029	.0210 6853	.0047 1335	.0001 6727
0.20	.3767 0595	.1547 4269	.0527 3877	.0155 2191	.0009 6270
0.25	.4924 6646	.2443 1497	.1018 5222	.0369 2116	.0035 1091
0.30	.5955 4719	.3416 8767	.1669 4060	.0714 4741	.0095 8082
0.35	.6836 3977	.4399 2706	.2444 0111	.1198 7622	.0213 8065
0.40	.7565 9809	.5336 9841	.3295 7009	.1811 8104	.0411 4972
0.45	.8155 1016	.6194 0112	.4176 4228	.2528 8240	.0706 9670
0.50	.8620 7543	.6950 0043	.5043 2012	.3315 9190	.1110 1858
0.55	.8982 0422	.7597 2272	.5861 8473	.4135 8527	.1620 8850
0.60	.9257 7495	.8137 1754	.6608 3356	.4952 9306	.2228 4109
0.65	.9464 9993	.8577 4460	.7268 4971	.5736 5255	.2913 3173
0.70	.9618 6322	.8929 1345	.7836 6736	.6463 0825	.3650 1374
0.75	.9731 0417	.9204 8431	.8313 8754	.7116 7726	.4410 6596
0.80	.9812 2786	.9417 2749	.8705 8409	.7689 1146	.5167 0870
0.85	.9870 2988	.9578 3282	.9021 2561	.8177 9250	.5894 6300
0.90	.9911 2701	.9698 5856	.9270 2746	.8585 9285	.6573 2802
0.95	.9939 8866	.9787 0948	.9463 3886	.8919 2952	.7188 7097
1.00	.9959 6619	.9851 3462	.9610 6416	.9186 2883	.7732 3828
1.05	.9973 1862	.9897 3757	.9721 1387	.9396 1305	.8201 0599
1.10	.9982 3417	.9929 9334	.9802 7945	.9558 1336	.8595 9053
1.15	.9988 4780	.9952 6795	.9862 2570	.9681 0915	.8921 4049
1.20	.9992 5504	.9968 3814	.9904 9495	.9772 9050	.9184 2647
1.25	.9995 2270	.9979 0944	.9935 1849	.9840 3965	.9392 4102
1.30	.9996 9694	.9986 3204	.9956 3154	.9889 2646	.9554 1615
1.35	.9998 0929	.9991 1402	.9970 8932	.9924 1342	.9677 6114
1.40	.9998 8106	.9994 3197	.9980 8244	.9948 6645	.9770 2061
1.45	.9999 2648	.9996 3946	.9987 5072	.9965 6845	.9838 5012
1.50	.9999 5496	.9997 7343	.9991 9501	.9977 3355	.9888 0612
1.55	.9999 7264	.9998 5902	.9994 8691	.9985 2069	.9923 4626
1.60	.9999 8353	.9999 1313	.9996 7646	.9990 4567	.9948 3649
1.65	.9999 9017	.9999 4699	.9997 9815	.9993 9140	.9965 6218
1.70	.9999 9419	.9999 6797	.9998 7539	.9996 1629	.9977 4071
1.75	.9999 9659	.9999 8083	.9999 2388	.9997 6079	.9985 3415
1.80	.9999 9802	.9999 8863	.9999 5398	.9998 5253	.9990 6090
1.85	.9999 9886	.9999 9333	.9999 7246	.9999 1008	.9994 0583
1.90	.9999 9935	.9999 9612	.9999 8369	.9999 4577	.9996 2868
1.95	.9999 9963	.9999 9776	.9999 9044	.9999 6765	.9997 7077
2.00	.9999 9979	.9999 9872	.9999 9445	.9999 8091	.9998 6018
2.05	.9999 9988	.9999 9928	.9999 9681	.9999 8885	.9999 1573
2.10	.9999 9994	.9999 9960	.9999 9819	.9999 9356	.9999 4981
2.15	.9999 9997	.9999 9978	.9999 9898	.9999 9632	.9999 7045
2.20	.9999 9998	.9999 9988	.9999 9943	.9999 9792	.9999 8281
2.25	.9999 9999	.9999 9993	.9999 9969	.9999 9883	.9999 9011
2.30	.9999 9999	.9999 9996	.9999 9983	.9999 9935	.9999 9438
2.35	1.0000 0000	.9999 9998	.9999 9991	.9999 9965	.9999 9684
2.40		.9999 9999	.9999 9995	.9999 9981	.9999 9824
2.45		.9999 9999	.9999 9997	.9999 9990	.9999 9903
2.50		1.0000 0000	.9999 9999	.9999 9995	.9999 9947

W_7	$P(W_7,17)$	$P(W_7,18)$	$P(W_7,19)$	$P(W_7,20)$	$P(W_7,22)$
2.55			.9999 9999	.9999 9997	.9999 9972
2.60			1.0000 0000	.9999 9998	.9999 9985
2.65				.9999 9999	.9999 9992
2.70				1.0000 0000	.9999 9996
2.75					.9999 9998
2.80					.9999 9999
2.85					.9999 9999
2.90					1.0000 0000
2.95					
3.00					
3.05					
3.10					
3.15					
3.20					
3.25					
3.30					
3.35					
3.40					
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_7	$P(W_7,24)$	$P(W_7,26)$	$P(W_7,28)$	$P(W_7,30)$	$P(W_7,32)$
0.05	.0000 0000				
0.10	.0000 0014	.0000 0000			
0.15	.0000 0423	.0000 0008	.0000 0000		
0.20	.0000 4287	.0000 0150	.0000 0004	.0000 0000	
0.25	.0002 4141	.0000 1306	.0000 0059	.0000 0002	.0000 0000
0.30	.0009 3628	.0000 7224	.0000 0464	.0000 0026	.0000 0001
0.35	.0028 0285	.0002 9135	.0000 2527	.0000 0190	.0000 0013
0.40	.0069 3363	.0009 3066	.0001 0451	.0000 1017	.0000 0088
0.45	.0148 1260	.0024 8487	.0003 4973	.0000 4271	.0000 0464
0.50	.0281 6623	.0057 5329	.0009 8901	.0001 4780	.0000 1967
0.55	.0487 1445	.0118 5929	.0024 3801	.0004 3661	.0000 6974
0.60	.0778 7768	.0221 9263	.0053 6045	.0011 3048	.0002 1293
0.65	.1165 0864	.0382 6878	.0106 9806	.0026 1765	.0005 7297
0.70	.1647 0876	.0615 2390	.0196 4673	.0055 0636	.0013 8297
0.75	.2217 6484	.0930 8434	.0335 6638	.0106 5512	.0030 3683
0.80	.2862 1193	.1335 5833	.0538 2859	.0191 6035	.0061 3647
0.85	.3560 0144	.1828 9368	.0816 2396	.0322 8805	.0115 1855
0.90	.4287 3609	.2403 2971	.1177 6431	.0513 4823	.0202 4295
0.95	.5019 2684	.3044 5092	.1625 1913	.0775 2630	.0335 3056
1.00	.5732 3072	.3733 2929	.2155 1957	.1116 9876	.0526 4795
1.05	.6406 3902	.4447 2626	.2757 4963	.1542 6764	.0787 5012
1.10	.7025 9953	.5163 1859	.3416 2600	.2050 4715	.1127 0536
1.15	.7580 6958	.5859 1241	.4111 5127	.2632 2586	.1549 3360
1.20	.8065 0775	.6516 1751	.4821 1257	.3274 1334	.2052 9031
1.25	.8478 1875	.7119 6485	.5522 9290	.3957 6332	.2630 2052
1.30	.8822 6863	.7659 6182	.6196 6377	.4661 5184	.3267 9383
1.35	.9103 8707	.8130 9029	.6825 3527	.5363 8055	.3948 1596
1.40	.9328 7068	.8532 5911	.7396 5023	.6043 7377	.4649 9785
1.45	.9504 9688	.8867 2666	.7902 1954	.6683 4300	.5351 5453
1.50	.9640 5443	.9140 0890	.8339 0514	.7269 0078	.6032 0261
1.55	.9742 9239	.9357 8654	.8707 6299	.7791 1699	.6673 2914
1.60	.9818 8705	.9528 2129	.9011 6121	.8245 2006	.7261 1223
1.65	.9874 2432	.9658 8737	.9256 8813	.8630 5326	.7785 8462
1.70	.9913 9427	.9757 2074	.9450 6278	.8950 0019	.8242 4109
1.75	.9941 9432	.9829 8598	.9600 5660	.9208 9483	.8629 9896
1.80	.9961 3794	.9882 5837	.9714 3147	.9414 2967	.8951 2552
1.85	.9974 6621	.9920 1829	.9798 9560	.9573 7241	.9211 4790
1.90	.9983 6019	.9946 5432	.9860 7642	.9694 9767	.9417 5965
1.95	.9989 5296	.9964 7191	.9905 0790	.9785 3670	.9577 3503
2.00	.9993 4029	.9977 0494	.9936 2882	.9851 4494	.9698 5829
2.05	.9995 8976	.9985 2820	.9957 8872	.9898 8511	.9788 7118
2.10	.9997 4818	.9990 6935	.9972 5819	.9932 2279	.9854 3888
2.15	.9998 4740	.9994 1966	.9982 4137	.9955 3073	.9901 3220
2.20	.9999 0869	.9996 4305	.9988 8849	.9970 9858	.9934 2272
2.25	.9999 4604	.9997 8340	.9993 0764	.9981 4535	.9956 8713
2.30	.9999 6851	.9998 7032	.9995 7488	.9988 3244	.9972 1724
2.35	.9999 8185	.9999 2338	.9997 4264	.9992 7598	.9982 3288
2.40	.9999 8966	.9999 5532	.9998 4637	.9995 5766	.9988 9534
2.45	.9999 9418	.9999 7428	.9999 0955	.9997 3369	.9993 2009
2.50	.9999 9677	.9999 8539	.9999 4747	.9998 4198	.9995 8788

W_7	$P(W_7,24)$	$P(W_7,26)$	$P(W_7,28)$	$P(W_7,30)$	$P(W_7,32)$
2.55	.9999 9822	.9999 9180	.9999 6991	.9999 0757	.9997 5395
2.60	.9999 9904	.9999 9546	.9999 8299	.9999 4670	.9998 5527
2.65	.9999 9948	.9999 9751	.9999 9051	.9999 6969	.9999 1612
2.70	.9999 9973	.9999 9866	.9999 9477	.9999 8300	.9999 5208
2.75	.9999 9986	.9999 9928	.9999 9716	.9999 9059	.9999 7302
2.80	.9999 9993	.9999 9962	.9999 9848	.9999 9487	.9999 8502
2.85	.9999 9996	.9999 9980	.9999 9919	.9999 9724	.9999 9180
2.90	.9999 9998	.9999 9990	.9999 9958	.9999 9853	.9999 9557
2.95	.9999 9999	.9999 9995	.9999 9978	.9999 9923	.9999 9764
3.00	1.0000 0000	.9999 9997	.9999 9989	.9999 9960	.9999 9876
3.05		.9999 9999	.9999 9994	.9999 9980	.9999 9936
3.10		.9999 9999	.9999 9997	.9999 9990	.9999 9967
3.15		1.0000 0000	.9999 9999	.9999 9995	.9999 9983
3.20			.9999 9999	.9999 9997	.9999 9992
3.25			1.0000 0000	.9999 9999	.9999 9996
3.30				.9999 9999	.9999 9998
3.35				1.0000 0000	.9999 9999
3.40					1.0000 0000
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_7	$P(W_7, 34)$	$P(W_7, 36)$	$P(W_7, 38)$	$P(W_7, 40)$	$P(W_7, 50)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30	.0000 0000				
0.35	.0000 0001				
0.40	.0000 0007	.0000 0000			
0.45	.0000 0046	.0000 0004	.0000 0000		
0.50	.0000 0238	.0000 0026	.0000 0003	.0000 0000	
0.55	.0000 1011	.0000 0135	.0000 0017	.0000 0002	
0.60	.0000 3646	.0000 0575	.0000 0085	.0000 0012	
0.65	.0001 1412	.0000 2097	.0000 0359	.0000 0058	
0.70	.0003 1644	.0000 6684	.0000 1317	.0000 0244	
0.75	.0007 8955	.0001 8966	.0000 4253	.0000 0898	.0000 0000
0.80	.0017 9535	.0004 8580	.0001 2281	.0000 2925	.0000 0001
0.85	.0037 5964	.0011 3617	.0003 2103	.0000 8550	.0000 0006
0.90	.0073 1409	.0024 4972	.0007 6780	.0002 2698	.0000 0026
0.95	.0133 1649	.0049 0887	.0016 9497	.0005 5239	.0000 0104
1.00	.0228 3341	.0092 0519	.0034 7966	.0012 4246	.0000 0371
1.05	.0370 7407	.0162 5002	.0066 8618	.0026 0083	.0000 1199
1.10	.0572 7407	.0271 4542	.0120 9273	.0050 9762	.0000 3542
1.15	.0845 4055	.0431 0662	.0206 8787	.0094 0480	.0000 9615
1.20	.1196 8169	.0653 3722	.0336 2403	.0164 0938	.0002 4148
1.25	.1630 5133	.0948 7068	.0521 2238	.0271 9006	.0005 6429
1.30	.2144 3946	.1324 0285	.0773 3440	.0429 4733	.0012 3300
1.35	.2730 3207	.1781 4595	.1101 7766	.0648 8612	.0025 3053
1.40	.3374 5102	.2317 3384	.1511 7296	.0940 6208	.0048 9788
1.45	.4058 6886	.2921 9965	.2003 1380	.1312 1374	.0089 7322
1.50	.4761 8000	.3580 3352	.2569 9585	.1766 1051	.0156 1331
1.55	.5462 0004	.4273 1255	.3200 2362	.2299 4729	.0258 8189
1.60	.6138 6252	.4978 8203	.3876 9690	.2903 0938	.0409 9242
1.65	.6773 8563	.5675 5841	.4579 6397	.3562 1885	.0621 9992
1.70	.7353 8966	.6343 2308	.5286 1684	.4257 5747	.0906 4846
1.75	.7869 5650	.6964 8070	.5974 9714	.4967 4678	.1271 9403
1.80	.8316 3266	.7527 6425	.6626 8205	.5669 5604	.1722 3312
1.85	.8693 8543	.8023 8074	.7226 2614	.6343 0537	.2255 7151
1.90	.9005 2665	.8450 0074	.7762 4504	.6970 3524	.2863 6358
1.95	.9256 1989	.8807 0343	.8229 3848	.7538 2217	.3531 4020
2.00	.9453 8545	.9098 9249	.8625 5953	.8038 3197	.4239 2535
2.05	.9606 1441	.9331 9913	.8953 4404	.8467 1320	.4964 2430
2.10	.9720 9852	.9513 8641	.9218 1697	.8825 4197	.5682 5153
2.15	.9805 7923	.9652 6525	.9426 9180	.9117 3471	.6371 6100
2.20	.9867 1544	.9756 2831	.9587 7638	.9349 4606	.7012 4312
2.25	.9910 6769	.9832 0379	.9708 9421	.9529 6773	.7590 6238
2.30	.9940 9512	.9886 2806	.9798 2548	.9666 3961	.8097 2314
2.35	.9961 6128	.9924 3426	.9862 6878	.9767 7998	.8528 6495
2.40	.9975 4538	.9950 5281	.9908 2104	.9841 3717	.8886 0018
2.45	.9984 5582	.9968 1979	.9939 7227	.9893 6149	.9174 1342
2.50	.9990 4407	.9979 8980	.9961 1053	.9929 9412	.9400 4391

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ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION. VOLUM--ETC(U)
1970 H L HARTER

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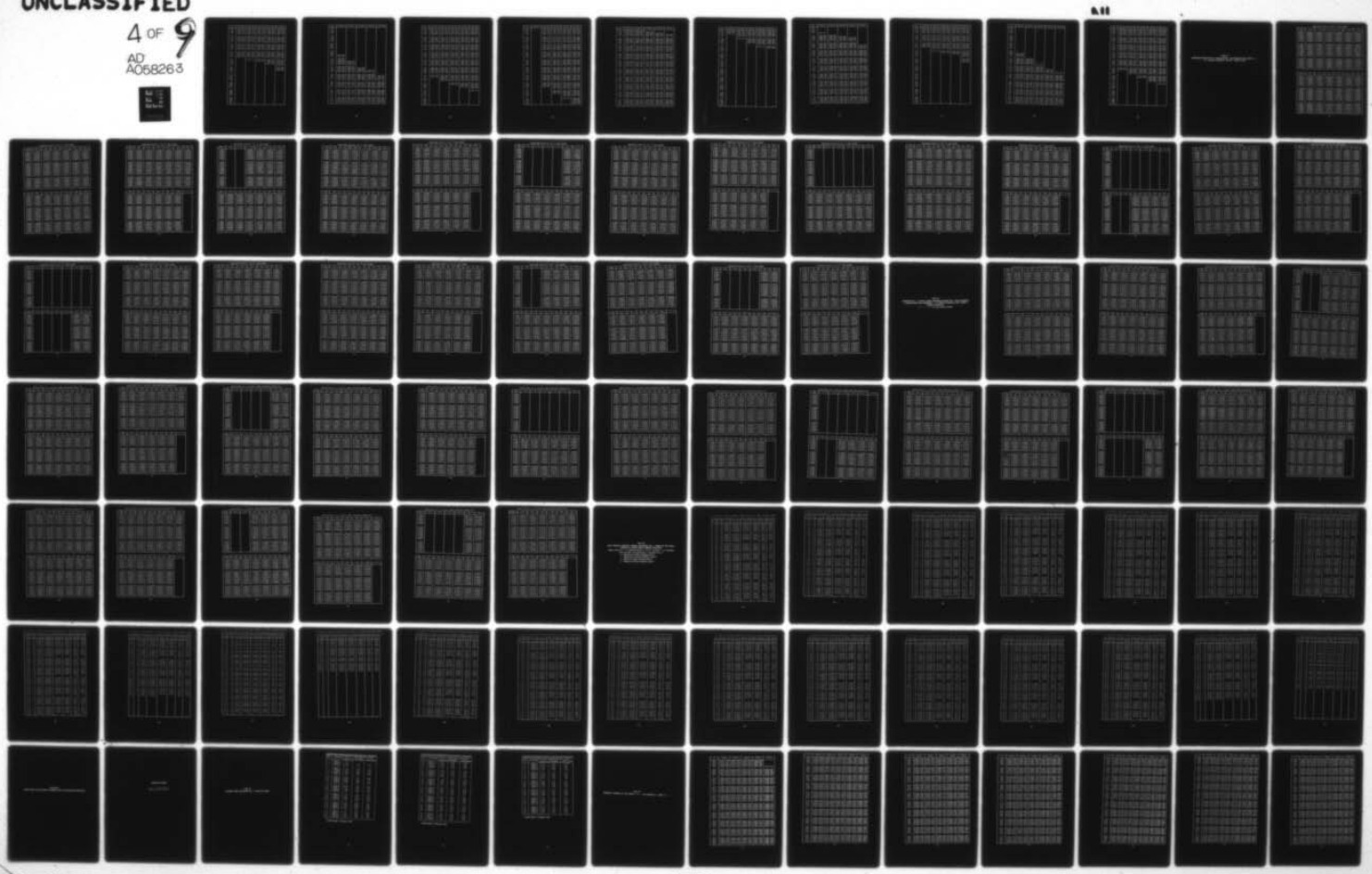

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W_7	$P(W_7,34)$	$P(W_7,36)$	$P(W_7,38)$	$P(W_7,40)$	$P(W_7,50)$
2.55	.9994 1755	.9987 5030	.9975 3336	.9954 6866	.9573 6982
2.60	.9996 5063	.9992 3571	.9984 6221	.9971 2077	.9703 0810
2.65	.9997 9366	.9995 4008	.9990 5731	.9982 0230	.9797 3790
2.70	.9998 7997	.9997 2762	.9994 3165	.9988 9681	.9864 4951
2.75	.9999 3123	.9998 4120	.9996 6292	.9993 3445	.9911 1710
2.80	.9999 6118	.9999 0885	.9998 0329	.9996 0517	.9942 9054
2.85	.9999 7840	.9999 4848	.9998 8702	.9997 6962	.9964 0093
2.90	.9999 8816	.9999 7131	.9999 3613	.9998 6776	.9977 7434
2.95	.9999 9360	.9999 8426	.9999 6444	.9999 2531	.9986 4942
3.00	.9999 9659	.9999 9150	.9999 8051	.9999 5848	.9991 9556
3.05	.9999 9821	.9999 9547	.9999 8948	.9999 7727	.9995 2957
3.10	.9999 9907	.9999 9762	.9999 9440	.9999 8775	.9997 2982
3.15	.9999 9953	.9999 9877	.9999 9707	.9999 9350	.9998 4757
3.20	.9999 9976	.9999 9937	.9999 9848	.9999 9660	.9999 1549
3.25	.9999 9988	.9999 9968	.9999 9923	.9999 9825	.9999 5395
3.30	.9999 9994	.9999 9984	.9999 9961	.9999 9911	.9999 7533
3.35	.9999 9997	.9999 9992	.9999 9981	.9999 9956	.9999 8700
3.40	.9999 9999	.9999 9996	.9999 9991	.9999 9978	.9999 9327
3.45	.9999 9999	.9999 9998	.9999 9995	.9999 9989	.9999 9657
3.50	1.0000 0000	.9999 9999	.9999 9998	.9999 9995	.9999 9828
3.55		1.0000 0000	.9999 9999	.9999 9998	.9999 9915
3.60			1.0000 0000	.9999 9999	.9999 9959
3.65				.9999 9999	.9999 9980
3.70				1.0000 0000	.9999 9991
3.75					.9999 9996
3.80					.9999 9998
3.85					.9999 9999
3.90					1.0000 0000
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_7	$P(W_7, .60)$	$P(W_7, .70)$	$P(W_7, .80)$	$P(W_7, .90)$	$P(W_7, 1.00)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90					
0.95	.0000 0000				
1.00	.0000 0001				
1.05	.0000 0003				
1.10	.0000 0011				
1.15	.0000 0046	.0000 0000			
1.20	.0000 0167	.0000 0001			
1.25	.0000 0554	.0000 0003			
1.30	.0000 1690	.0000 0014			
1.35	.0000 4758	.0000 0055	.0000 0000		
1.40	.0001 2430	.0000 0193	.0000 0002		
1.45	.0003 0269	.0000 0629	.0000 0009	.0000 0000	
1.50	.0006 8993	.0000 1887	.0000 0036	.0000 0001	
1.55	.0014 7755	.0000 5250	.0000 0132	.0000 0003	
1.60	.0029 8344	.0001 3599	.0000 0440	.0000 0011	.0000 0000
1.65	.0056 9819	.0003 2921	.0000 1356	.0000 0043	.0000 0001
1.70	.0103 2526	.0007 4743	.0000 3871	.0000 0155	.0000 0005
1.75	.0178 0035	.0015 9666	.0001 0288	.0000 0515	.0000 0021
1.80	.0292 7305	.0032 1908	.0002 5541	.0000 1577	.0000 0080
1.85	.0460 3709	.0061 4281	.0005 9427	.0000 4486	.0000 0278
1.90	.0694 0463	.0111 2488	.0012 9990	.0001 1886	.0000 0895
1.95	.1005 3352	.0191 7038	.0026 8078	.0002 9430	.0000 2665
2.00	.1402 3161	.0315 0923	.0052 2671	.0006 8304	.0000 7379
2.05	.1887 7391	.0495 1537	.0096 5923	.0014 9025	.0001 9049
2.10	.2457 7195	.0745 6393	.0169 6224	.0030 6503	.0004 6001
2.15	.3101 2830	.1078 3770	.0283 7216	.0059 5803	.0010 4207
2.20	.3800 9332	.1501 1175	.0453 0833	.0109 7380	.0022 2053
2.25	.4534 1981	.2015 5795	.0692 3472	.0191 9778	.0044 6263
2.30	.5275 9059	.2616 1403	.1014 6025	.0319 7475	.0084 7997
2.35	.6000 7929	.3289 5322	.1429 0552	.0508 1882	.0152 7319
2.40	.6685 9988	.4015 6998	.1938 8042	.0772 4777	.0261 3562
2.45	.7313 0594	.4769 7257	.2539 2365	.1125 5470	.0425 9089
2.50	.7869 1402	.5524 4909	.3217 4815	.1575 5306	.0662 4921

W_7	$P(W_7,.60)$	$P(W_7,.70)$	$P(W_7,.80)$	$P(W_7,.90)$	$P(W_7,.100)$
2.55	.8347 4275	.6253 5870	.3953 1525	.2123 4762	.0985 8620
2.60	.8746 7524	.6933 9702	.4720 3160	.2761 8856	.1406 7360
2.65	.9070 6422	.7547 9384	.5490 3460	.3474 5260	.1929 1445
2.70	.9326 0491	.8084 1913	.6235 1257	.4237 6810	.2548 4600
2.75	.9522 0006	.8537 9398	.6930 0093	.5022 6692	.3250 6711
2.80	.9668 3690	.8910 2077	.7556 0523	.5799 1591	.4013 2095
2.85	.9774 8861	.9206 5871	.8101 2187	.6538 6338	.4807 2703
2.90	.9850 4548	.9435 7454	.8560 5168	.7217 3653	.5601 1983
2.95	.9902 7522	.9607 9509	.8935 2240	.7818 4196	.6364 2598
3.00	.9938 0779	.9733 8139	.9231 5005	.8332 4705	.7070 0644
3.05	.9961 3814	.9823 3488	.9458 7335	.8757 4757	.7699 0386
3.10	.9976 4026	.9885 3818	.9627 9190	.9097 4779	.8239 6229
3.15	.9985 8687	.9927 2678	.9750 2978	.9360 9028	.8688 1802
3.20	.9991 7037	.9954 8484	.9836 3623	.9558 7336	.9047 8655
3.25	.9995 2235	.9972 5693	.9895 2504	.9702 8634	.9326 8550
3.30	.9997 3023	.9983 6859	.9934 4803	.9804 8128	.9536 3676
3.35	.9998 5049	.9990 4982	.9959 9415	.9874 8812	.9688 8330
3.40	.9999 1866	.9994 5786	.9976 0516	.9921 7077	.9796 4402
3.45	.9999 5655	.9996 9686	.9985 9951	.9952 1588	.9870 1586
3.50	.9999 7721	.9998 3384	.9991 9856	.9971 4414	.9919 2177
3.55	.9999 8825	.9999 1068	.9995 5104	.9983 3391	.9950 9577
3.60	.9999 9405	.9999 5290	.9997 5370	.9990 4969	.9970 9359
3.65	.9999 9704	.9999 7563	.9998 6762	.9994 6983	.9983 1787
3.70	.9999 9855	.9999 8762	.9999 3027	.9997 1058	.9990 4881
3.75	.9999 9930	.9999 9382	.9999 6399	.9998 4534	.9994 7426
3.80	.9999 9967	.9999 9697	.9999 8176	.9999 1906	.9997 1584
3.85	.9999 9985	.9999 9854	.9999 9094	.9999 5850	.9998 4974
3.90	.9999 9993	.9999 9931	.9999 9558	.9999 7915	.9999 2223
3.95	.9999 9997	.9999 9968	.9999 9788	.9999 8973	.9999 6059
4.00	.9999 9999	.9999 9985	.9999 9900	.9999 9503	.9999 8044
4.05	.9999 9999	.9999 9993	.9999 9954	.9999 9765	.9999 9048
4.10	1.0000 0000	.9999 9997	.9999 9979	.9999 9890	.9999 9546
4.15		.9999 9999	.9999 9991	.9999 9950	.9999 9788
4.20		.9999 9999	.9999 9996	.9999 9978	.9999 9902
4.25		1.0000 0000	.9999 9998	.9999 9990	.9999 9956
4.30			.9999 9999	.9999 9996	.9999 9981
4.35			1.0000 0000	.9999 9998	.9999 9992
4.40				.9999 9999	.9999 9996
4.45				1.0000 0000	.9999 9998
4.50					.9999 9999
4.55					1.0000 0000
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_8	$P(W_8,17)$	$P(W_8,18)$	$P(W_8,19)$	$P(W_8,20)$	$P(W_8,22)$
0.05		.2935 8305	.0505 7275	.0063 0299	.0000 5272
0.10		.5046 2180	.1637 6641	.0395 7379	.0012 8309
0.15		.6551 7287	.2993 1448	.1048 5968	.0073 8702
0.20		.7617 5206	.4340 2929	.1953 4548	.0235 3523
0.25		.8366 2150	.5558 4734	.3003 8231	.0541 7878
0.30		.8888 0793	.6596 6624	.4096 7796	.1015 1466
0.35		.9248 9974	.7445 0759	.5151 2938	.1650 2069
0.40		.9496 6458	.8116 4094	.6113 0229	.2418 3988
0.45		.9665 2298	.8633 8855	.6952 1214	.3276 1712
0.50		.9779 0788	.9024 0047	.7658 1034	.4174 3302
0.55		.9855 3487	.9312 4501	.8234 0851	.5065 9928
0.60		.9906 0322	.9522 0336	.8691 6019	.5912 0436
0.65		.9939 4401	.9671 9066	.9046 4924	.6683 9261
0.70		.9961 2815	.9777 5043	.9315 9376	.7364 1785
0.75		.9975 4440	.9850 8764	.9516 5310	.7945 3798
0.80		.9984 5517	.9901 1865	.9663 1715	.8428 1898
0.85		.9990 3602	.9935 2483	.9768 5578	.8819 0640
0.90		.9994 0338	.9958 0290	.9843 0853	.9128 0542
0.95		.9996 3377	.9973 0850	.9894 9882	.9366 9418
1.00		.9997 7705	.9982 9213	.9930 6079	.9547 8119
1.05		.9998 6540	.9989 2751	.9954 7098	.9682 0750
1.10		.9999 1942	.9993 3342	.9970 7969	.9779 8855
1.15		.9999 5216	.9995 8991	.9981 3929	.9849 8721
1.20		.9999 7184	.9997 5025	.9988 2825	.9899 0939
1.25		.9999 8356	.9998 4942	.9992 7058	.9933 1417
1.30		.9999 9049	.9999 1012	.9995 5109	.9956 3180
1.35		.9999 9454	.9999 4688	.9997 2682	.9971 8504
1.40		.9999 9690	.9999 6892	.9998 3561	.9982 1034
1.45		.9999 9825	.9999 8199	.9999 0216	.9988 7723
1.50		.9999 9902	.9999 8967	.9999 4240	.9993 0478
1.55		.9999 9946	.9999 9413	.9999 6646	.9995 7505
1.60		.9999 9970	.9999 9670	.9999 8068	.9997 4354
1.65		.9999 9984	.9999 9816	.9999 8899	.9998 4717
1.70		.9999 9991	.9999 9898	.9999 9379	.9999 1005
1.75		.9999 9995	.9999 9945	.9999 9654	.9999 4771
1.80		.9999 9998	.9999 9970	.9999 9809	.9999 6997
1.85		.9999 9999	.9999 9984	.9999 9896	.9999 8296
1.90		.9999 9999	.9999 9991	.9999 9944	.9999 9045
1.95		1.0000 0000	.9999 9996	.9999 9970	.9999 9471
2.00			.9999 9998	.9999 9984	.9999 9710
2.05			.9999 9999	.9999 9992	.9999 9843
2.10			.9999 9999	.9999 9996	.9999 9916
2.15			1.0000 0000	.9999 9998	.9999 9956
2.20				.9999 9999	.9999 9977
2.25				.9999 9999	.9999 9988
2.30				1.0000 0000	.9999 9994
2.35					.9999 9997
2.40					.9999 9998
2.45					.9999 9999
2.50					1.0000 0000

W_8	$P(W_8,24)$	$P(W_8,26)$	$P(W_8,28)$	$P(W_8,30)$	$P(W_8,32)$
0.05	.0000 0026	.0000 0000			
0.10	.0000 2457	.0000 0033	.0000 0000		
0.15	.0003 1273	.0000 0932	.0000 0021	.0000 0000	
0.20	.0017 3658	.0000 9092	.0000 0369	.0000 0012	.0000 0000
0.25	.0061 1000	.0004 9308	.0000 3097	.0000 0160	.0000 0007
0.30	.0160 8627	.0018 4116	.0001 6477	.0000 1216	.0000 0077
0.35	.0346 3873	.0053 0590	.0006 3871	.0000 6359	.0000 0543
0.40	.0643 4357	.0126 3456	.0019 6065	.0002 5244	.0000 2793
0.45	.1067 3348	.0259 8234	.0050 2962	.0008 1060	.0001 1251
0.50	.1619 1593	.0475 6385	.0111 8697	.0021 9896	.0003 7310
0.55	.2285 2663	.0792 1583	.0221 5134	.0051 9863	.0010 5581
0.60	.3039 7891	.1219 9298	.0398 2146	.0109 6027	.0026 1791
0.65	.3849 0316	.1759 0290	.0659 7657	.0209 7275	.0058 0363
0.70	.4676 5167	.2398 3903	.1019 4107	.0369 2974	.0116 8621
0.75	.5487 6128	.3117 1329	.1482 9486	.0605 0314	.0216 4443
0.80	.6253 0311	.3887 4248	.2046 9893	.0930 6326	.0372 5375
0.85	.6950 8932	.4678 1564	.2698 7523	.1354 0608	.0600 9433
0.90	.7567 4070	.5458 6552	.3417 4006	.1875 5083	.0915 0428
0.95	.8096 4195	.6201 8158	.4176 5666	.2486 5488	.1323 2680
1.00	.8538 2131	.6886 2584	.4947 5084	.3170 6517	.1827 0689
1.05	.8897 9215	.7497 3904	.5702 2906	.3904 9380	.2419 8488
1.10	.9183 8769	.8027 4597	.6416 4727	.4662 7977	.3087 1226
1.15	.9406 1127	.8474 8318	.7070 9725	.5416 8541	.3807 8792
1.20	.9575 1472	.8842 7793	.7652 9799	.6141 7543	.4556 8700
1.25	.9701 0976	.9138 0662	.8155 9827	.6816 3744	.5307 3817
1.30	.9793 1115	.9369 5591	.8579 0942	.7425 2001	.6033 9947
1.35	.9859 0684	.9547 0198	.8925 9354	.7958 8297	.6714 8985
1.40	.9905 4885	.9680 1648	.9203 3218	.8413 6997	.7333 4737
1.45	.9937 5842	.9778 0127	.9419 9693	.8791 2376	.7879 0279
1.50	.9959 3970	.9848 4968	.9585 3659	.9096 6809	.8346 7345
1.55	.9973 9751	.9898 2961	.9708 8912	.9337 7947	.8736 9433
1.60	.9983 5605	.9932 8262	.9799 2061	.9523 6690	.9054 0890
1.65	.9989 7634	.9956 3357	.9863 8941	.9663 7150	.9305 4323
1.70	.9993 7154	.9972 0599	.9909 3107	.9766 9184	.9499 8321
1.75	.9996 1951	.9982 3960	.9940 5836	.9841 3537	.9646 6857
1.80	.9997 7279	.9989 0762	.9961 7139	.9893 9302	.9755 1150
1.85	.9998 6615	.9993 3225	.9975 7300	.9930 3199	.9833 4162
1.90	.9999 2221	.9995 9782	.9984 8610	.9955 0121	.9888 7532
1.95	.9999 5538	.9997 6129	.9990 7056	.9971 4463	.9927 0475
2.00	.9999 7475	.9998 6035	.9994 3825	.9982 1797	.9953 0102
2.05	.9999 8589	.9999 1946	.9996 6570	.9989 0615	.9970 2636
2.10	.9999 9222	.9999 5420	.9998 0406	.9993 3948	.9981 5072
2.15	.9999 9576	.9999 7432	.9998 8688	.9996 0753	.9988 6955
2.20	.9999 9772	.9999 8579	.9999 3566	.9997 7049	.9993 2058
2.25	.9999 9879	.9999 9225	.9999 6394	.9998 6788	.9995 9843
2.30	.9999 9937	.9999 9583	.9999 8008	.9999 2512	.9997 6654
2.35	.9999 9967	.9999 9778	.9999 8915	.9999 5821	.9998 6646
2.40	.9999 9983	.9999 9884	.9999 9418	.9999 7703	.9999 2484
2.45	.9999 9992	.9999 9940	.9999 9692	.9999 8756	.9999 5836
2.50	.9999 9996	.9999 9969	.9999 9839	.9999 9336	.9999 7729

W_8	$P(W_8,.24)$	$P(W_8,.26)$	$P(W_8,.28)$	$P(W_8,.30)$	$P(W_8,.32)$
2.55	.9999 9998	.9999 9985	.9999 9917	.9999 9651	.9999 8781
2.60	.9999 9999	.9999 9992	.9999 9958	.9999 9819	.9999 9355
2.65	1.0000 0000	.9999 9996	.9999 9979	.9999 9908	.9999 9664
2.70		.9999 9998	.9999 9990	.9999 9953	.9999 9828
2.75		.9999 9999	.9999 9995	.9999 9977	.9999 9913
2.80		1.0000 0000	.9999 9998	.9999 9989	.9999 9957
2.85			.9999 9999	.9999 9995	.9999 9979
2.90			.9999 9999	.9999 9997	.9999 9990
2.95			1.0000 0000	.9999 9999	.9999 9995
3.00				.9999 9999	.9999 9998
3.05				1.0000 0000	.9999 9999
3.10					1.0000 0000
3.15					
3.20					
3.25					
3.30					
3.35					
3.40					
3.45					
3.50					
3.55					
3.60					
3.65					
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_8	$P(W_8, .34)$	$P(W_8, .36)$	$P(W_8, .38)$	$P(W_8, .40)$	$P(W_8, .50)$
0.05					
0.10					
0.15					
0.20					
0.25	.0000 0000				
0.30	.0000 0004	.0000 0000			
0.35	.0000 0041	.0000 0003	.0000 0000		
0.40	.0000 0273	.0000 0024	.0000 0002	.0000 0000	
0.45	.0000 1379	.0000 0152	.0000 0015	.0000 0001	
0.50	.0000 5600	.0000 0758	.0000 0094	.0000 0011	
0.55	.0001 9000	.0000 3086	.0000 0459	.0000 0063	
0.60	.0005 5506	.0001 0635	.0000 1868	.0000 0304	
0.65	.0014 2845	.0003 1814	.0000 6500	.0000 1232	.0000 0000
0.70	.0032 9647	.0008 4266	.0001 9782	.0000 4312	.0000 0001
0.75	.0069 1910	.0020 0766	.0005 3561	.0001 3278	.0000 0005
0.80	.0133 6184	.0043 5796	.0013 0849	.0003 6540	.0000 0027
0.85	.0239 6759	.0087 0972	.0029 1782	.0009 1005	.0000 0118
0.90	.0402 5155	.0161 6863	.0059 9663	.0020 7287	.0000 0453
0.95	.0637 2105	.0280 8849	.0114 5136	.0043 5660	.0000 1553
1.00	.0956 4490	.0459 5677	.0204 6158	.0085 1292	.0000 4800
1.05	.1368 1584	.0712 1205	.0344 1738	.0155 6693	.0001 3491
1.10	.1873 5681	.1050 1892	.0547 8627	.0267 9152	.0003 4768
1.15	.2466 1605	.1480 4253	.0829 1967	.0436 1609	.0008 2720
1.20	.3131 7696	.2002 7130	.1198 2863	.0674 6828	.0018 2799
1.25	.3849 8356	.2609 2903	.1659 7194	.0995 6622	.0037 7227
1.30	.4595 5774	.3284 9968	.2211 0344	.1406 9639	.0073 0448
1.35	.5342 6713	.4008 6324	.2842 1517	.1910 2262	.0133 2962
1.40	.6065 9589	.4755 1799	.3535 9357	.2499 6964	.0230 1448
1.45	.6743 7560	.5498 4787	.4269 8135	.3162 1153	.0377 3196
1.50	.7359 4619	.6213 8807	.5018 1566	.3877 7301	.0589 3786
1.55	.7902 3397	.6880 4729	.5754 9921	.4622 2714	.0879 8538
1.60	.8367 4997	.7482 5831	.6456 5782	.5369 5366	.1259 0204
1.65	.8755 2419	.8010 4525	.7103 4543	.6094 1165	.1731 6994
1.70	.9069 9820	.8460 1230	.7681 7215	.6773 8137	.2295 5737
1.75	.9318 9942	.8832 7047	.8183 4805	.7391 4099	.2940 4408
1.80	.9511 1740	.9133 2522	.8606 5122	.7935 6013	.3648 6450
1.85	.9655 9656	.9369 4861	.8953 3906	.8401 0967	.4396 6739
1.90	.9762 5350	.9550 5590	.9230 2715	.8788 0151	.5157 6492
1.95	.9839 2107	.9686 0048	.9445 5868	.9100 8072	.5904 2533
2.00	.9893 1717	.9784 9453	.9608 8369	.9346 9511	.6611 5675
2.05	.9930 3373	.9855 5697	.9729 6004	.9535 6451	.7259 3582
2.10	.9955 4025	.9904 8603	.9816 8189	.9676 6646	.7833 5040
2.15	.9971 9632	.9938 5147	.9878 3562	.9779 4776	.8326 4622
2.20	.9982 6873	.9961 0058	.9920 7964	.9852 6490	.8736 8615
2.25	.9989 4967	.9975 7249	.9949 4223	.9903 5141	.9068 4466
2.30	.9993 7380	.9985 1625	.9968 3156	.9938 0705	.9328 6641
2.35	.9996 3303	.9991 0933	.9980 5232	.9961 0265	.9527 1693
2.40	.9997 8856	.9994 7480	.9988 2486	.9975 9456	.9674 4760
2.45	.9998 8020	.9996 9570	.9993 0391	.9985 4357	.9780 8888
2.50	.9999 3323	.9998 2672	.9995 9508	.9991 3470	.9855 7702

W_8	$P(W_8,.34)$	$P(W_8,.36)$	$P(W_8,.38)$	$P(W_8,.40)$	$P(W_8,.50)$
2.55	.9999 6339	.9999 0301	.9997 6864	.9994 9540	.9907 1317
2.60	.9999 8025	.9999 4662	.9998 7012	.9997 1111	.9941 4911
2.65	.9999 8951	.9999 7110	.9999 2834	.9998 3758	.9963 9220
2.70	.9999 9452	.9999 8461	.9999 6114	.9999 1031	.9978 2201
2.75	.9999 9718	.9999 9194	.9999 7928	.9999 5133	.9987 1236
2.80	.9999 9857	.9999 9584	.9999 8914	.9999 7405	.9992 5427
2.85	.9999 9929	.9999 9789	.9999 9440	.9999 8640	.9995 7679
2.90	.9999 9965	.9999 9895	.9999 9716	.9999 9299	.9997 6458
2.95	.9999 9983	.9999 9948	.9999 9858	.9999 9645	.9998 7160
3.00	.9999 9992	.9999 9975	.9999 9930	.9999 9823	.9999 3131
3.05	.9999 9996	.9999 9988	.9999 9966	.9999 9913	.9999 6395
3.10	.9999 9998	.9999 9994	.9999 9984	.9999 9958	.9999 8144
3.15	.9999 9999	.9999 9997	.9999 9992	.9999 9980	.9999 9062
3.20	1.0000 0000	.9999 9999	.9999 9997	.9999 9991	.9999 9534
3.25		.9999 9999	.9999 9998	.9999 9996	.9999 9773
3.30		1.0000 0000	.9999 9999	.9999 9998	.9999 9891
3.35			1.0000 0000	.9999 9999	.9999 9949
3.40				1.0000 0000	.9999 9976
3.45					.9999 9989
3.50					.9999 9995
3.55					.9999 9998
3.60					.9999 9999
3.65					1.0000 0000
3.70					
3.75					
3.80					
3.85					
3.90					
3.95					
4.00					
4.05					
4.10					
4.15					
4.20					
4.25					
4.30					
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

W_8	$P(W_8,60)$	$P(W_8,70)$	$P(W_8,80)$	$P(W_8,90)$	$P(W_8,100)$
0.05					
0.10					
0.15					
0.20					
0.25					
0.30					
0.35					
0.40					
0.45					
0.50					
0.55					
0.60					
0.65					
0.70					
0.75					
0.80					
0.85					
0.90	.0000 0000				
0.95	.0000 0002				
1.00	.0000 0011				
1.05	.0000 0046	.0000 0000			
1.10	.0000 0181	.0000 0001			
1.15	.0000 0637	.0000 0003			
1.20	.0000 2035	.0000 0013			
1.25	.0000 5951	.0000 0052	.0000 0000		
1.30	.0001 6027	.0000 0196	.0000 0002		
1.35	.0003 9959	.0000 0672	.0000 0007		
1.40	.0009 2698	.0000 2110	.0000 0032	.0000 0000	
1.45	.0020 0973	.0000 6094	.0000 0123	.0000 0002	
1.50	.0040 8869	.0001 6280	.0000 0433	.0000 0008	.0000 0000
1.55	.0078 3485	.0004 0409	.0000 1398	.0000 0036	.0000 0001
1.60	.0141 8970	.0009 3569	.0000 4156	.0000 0137	.0000 0004
1.65	.0243 6740	.0020 2881	.0001 1436	.0000 0479	.0000 0016
1.70	.0397 9689	.0041 3360	.0002 9229	.0000 1540	.0000 0064
1.75	.0619 9173	.0079 3979	.0006 9661	.0000 4567	.0000 0238
1.80	.0923 5214	.0144 2156	.0015 5343	.0001 2549	.0000 0807
1.85	.1319 2535	.0248 4265	.0032 5189	.0003 2048	.0000 2521
1.90	.1811 6886	.0406 9736	.0064 1000	.0007 6346	.0000 7277
1.95	.2397 7029	.0635 7270	.0119 3241	.0017 0195	.0001 9481
2.00	.3065 7125	.0949 3539	.0210 3558	.0035 6138	.0004 8534
2.05	.3796 2269	.1358 7171	.0352 1289	.0070 1566	.0011 2897
2.10	.4563 6931	.1868 2996	.0561 1722	.0130 4706	.0024 5945
2.15	.5339 3119	.2474 2574	.0853 5676	.0229 6780	.0050 3235
2.20	.6094 2900	.3163 6408	.1242 2494	.0383 7289	.0096 9832
2.25	.6802 9270	.3915 0881	.1734 1279	.0610 0103	.0176 5177
2.30	.7445 0136	.4700 9532	.2327 6934	.0925 0179	.0304 2205
2.35	.8007 2178	.5490 4830	.3011 7543	.1341 3659	.0497 7562
2.40	.8483 3754	.6253 4209	.3765 7493	.1864 7138	.0775 1356
2.45	.8873 8268	.6963 3442	.4561 7045	.2491 3552	.1151 7818
2.50	.9184 0861	.7600 1553	.5367 4982	.3207 1751	.1637 1742

W_8	$P(W_8,.60)$	$P(W_8,.70)$	$P(W_8,.80)$	$P(W_8,.90)$	$P(W_8,.100)$
2.55	.9423 1908	.8151 3933	.6150 7743	.3988 3946	.2231 8341
2.60	.9602 0463	.8612 3150	.6882 7152	.4804 0859	.2925 4888
2.65	.9732 0023	.8984 9509	.7540 9763	.5619 9782	.3697 0456
2.70	.9823 7903	.9276 4944	.8111 3370	.6402 7574	.4516 5739
2.75	.9886 8525	.9497 4256	.8587 9632	.7123 9747	.5348 9619
2.80	.9929 0255	.9659 7201	.8972 4766	.7762 8444	.6158 4723
2.85	.9956 4954	.9775 3807	.9272 2276	.8307 5417	.6913 2150
2.90	.9973 9335	.9855 4068	.9498 2329	.8755 0010	.7588 6415
2.95	.9984 7283	.9909 2036	.9663 1870	.9109 5261	.8169 4892
3.00	.9991 2483	.9944 3647	.9779 8296	.9380 7064	.8650 0337
3.05	.9995 0926	.9966 7233	.9859 8037	.9581 1505	.9032 9080
3.10	.9997 3066	.9980 5645	.9913 0114	.9724 4498	.9326 9957
3.15	.9998 5526	.9988 9115	.9947 3875	.9823 6213	.9544 9800
3.20	.9999 2381	.9993 8179	.9968 9703	.9890 1155	.9701 0487
3.25	.9999 6071	.9996 6306	.9982 1475	.9933 3455	.9809 0798
3.30	.9999 8014	.9998 2042	.9989 9763	.9960 6182	.9881 4414
3.35	.9999 9016	.9999 0636	.9994 5054	.9977 3268	.9928 3841
3.40	.9999 9522	.9999 5221	.9997 0583	.9987 2747	.9957 9020
3.45	.9999 9772	.9999 7613	.9998 4611	.9993 0346	.9975 9077
3.50	.9999 9893	.9999 8832	.9999 2131	.9996 2800	.9986 5706
3.55	.9999 9951	.9999 9440	.9999 6065	.9998 0606	.9992 7054
3.60	.9999 9978	.9999 9737	.9999 8075	.9999 0126	.9996 1370
3.65	.9999 9990	.9999 9879	.9999 9078	.9999 5089	.9998 0047
3.70	.9999 9996	.9999 9945	.9999 9568	.9999 7612	.9998 9942
3.75	.9999 9998	.9999 9976	.9999 9802	.9999 8865	.9999 5050
3.80	.9999 9999	.9999 9989	.9999 9911	.9999 9472	.9999 7621
3.85	1.0000 0000	.9999 9995	.9999 9961	.9999 9760	.9999 8882
3.90		.9999 9998	.9999 9983	.9999 9893	.9999 9487
3.95		.9999 9999	.9999 9993	.9999 9953	.9999 9769
4.00		1.0000 0000	.9999 9997	.9999 9980	.9999 9899
4.05			.9999 9999	.9999 9992	.9999 9956
4.10			1.0000 0000	.9999 9997	.9999 9982
4.15				.9999 9999	.9999 9992
4.20				.9999 9999	.9999 9997
4.25				1.0000 0000	.9999 9999
4.30					1.0000 0000
4.35					
4.40					
4.45					
4.50					
4.55					
4.60					
4.65					
4.70					
4.75					
4.80					
4.85					
4.90					
4.95					
5.00					

Table A7

PERCENTAGE POINTS OF THE rth QUASI-RANGE W_r FOR SAMPLES OF SIZE n FROM $N(\mu, 1)$
[P = cumulative probability = Prob ($W_r \leq$ tabular value)]

PERCENTAGE POINTS OF THE 0th QUASI-RANGE

P\n	2	3	4	5	6	7
0.0001	0.000177	0.019047	0.092394	0.205489	0.334167	0.464516
0.0005	0.000886	0.042594	0.158155	0.308222	0.463700	0.612589
0.0010	0.001772	0.060245	0.199446	0.367392	0.534736	0.691347
0.0050	0.008862	0.134847	0.342702	0.554904	0.748983	0.921826
0.0100	0.017725	0.190945	0.433676	0.665015	0.869515	1.048144
0.0250	0.044319	0.303071	0.594643	0.849672	1.065952	1.250500
0.0500	0.088681	0.431402	0.759533	1.029940	1.252886	1.440141
0.1000	0.177712	0.618352	0.979366	1.261398	1.488195	1.676051
0.2000	0.358287	0.900092	1.285672	1.573441	1.799995	1.985445
0.3000	0.544926	1.138259	1.531485	1.818447	2.042028	2.223993
0.4000	0.741614	1.362597	1.756529	2.040097	2.259641	2.437704
0.5000	0.953873	1.587788	1.978321	2.256883	2.471652	2.645453
0.6000	1.190232	1.826320	2.210281	2.482427	2.691658	2.860733
0.7000	1.465738	2.094590	2.468799	2.732888	2.935559	3.099199
0.8000	1.812388	2.423529	2.783758	3.037317	3.231739	3.388684
0.9000	2.326174	2.902380	3.240446	3.478281	3.660721	3.808098
0.9500	2.771808	3.314493	3.633160	3.857656	4.030092	4.169554
0.9750	3.169822	3.682268	3.984015	4.197026	4.360906	4.493624
0.9900	3.642773	4.120303	4.402801	4.602821	4.757047	4.882166
0.9950	3.969745	4.424235	4.694087	4.885585	5.033479	5.153613
0.9990	4.653508	5.063453	5.308804	5.483754	5.619332	5.729754
0.9995	4.922533	5.316400	5.552855	5.721773	5.852849	5.959710
0.9999	5.502128	5.864157	6.082863	6.239691	6.361709	6.461391

P\n	8	9	10	11	12	13
0.0001	0.590186	0.708709	0.819433	0.922513	1.018443	1.107819
0.0005	0.751013	0.878357	0.995219	1.102585	1.201493	1.292919
0.0010	0.834826	0.965507	1.084583	1.193404	1.293251	1.385253
0.0050	1.075282	1.212115	1.334928	1.445920	1.546898	1.639328
0.0100	1.204819	1.343386	1.467033	1.578304	1.679205	1.771332
0.0250	1.410019	1.549720	1.673518	1.784355	1.884475	1.975612
0.0500	1.600413	1.739852	1.862844	1.972583	2.071455	2.161277
0.1000	1.835449	1.973327	2.094446	2.202195	2.299057	2.386902
0.2000	2.141656	2.276121	2.393843	2.498316	2.592064	2.676969
0.3000	2.376728	2.507898	2.622556	2.724195	2.815328	2.897817
0.4000	2.586852	2.714772	2.826491	2.925467	3.014177	3.094450
0.5000	2.790841	2.915438	3.024202	3.120531	3.206854	3.284960
0.6000	3.002059	3.123122	3.228778	3.322347	3.406194	3.482065
0.7000	3.235931	3.353046	3.455258	3.545785	3.626919	3.700346
0.8000	3.519834	3.632192	3.730280	3.817183	3.895093	3.965627
0.9000	3.931349	4.037023	4.129346	4.211200	4.284635	4.351158
0.9500	4.286309	4.386509	4.474124	4.551864	4.621655	4.684920
0.9750	4.604857	4.700411	4.784033	4.858286	4.924993	4.985497
0.9900	4.987183	5.077506	5.156635	5.226963	5.290196	5.347592
0.9950	5.254550	5.341439	5.417616	5.485364	5.546312	5.601663
0.9990	5.822728	5.902906	5.973307	6.036000	6.092467	6.143802
0.9995	6.049760	6.127468	6.195739	6.256567	6.311378	6.361227
0.9999	6.545529	6.618235	6.682187	6.739225	6.790667	6.837489

PERCENTAGE POINTS OF THE 0th QUASI-RANGE

P\n	14	15	16	17	18	19
0.0001	1.191258	1.269336	1.342579	1.411460	1.476395	1.537756
0.0005	1.377729	1.456683	1.530433	1.599544	1.664502	1.725726
0.0010	1.470384	1.549474	1.623228	1.692245	1.757038	1.818046
0.0050	1.724404	1.803104	1.876237	1.944472	2.008372	2.068413
0.0100	1.855958	1.934115	2.006645	2.074243	2.137488	2.196867
0.0250	2.059129	2.136114	2.207443	2.273835	2.335885	2.394088
0.0500	2.243459	2.319117	2.389145	2.454273	2.515097	2.572117
0.1000	2.467168	2.540983	2.609247	2.672690	2.731908	2.787396
0.2000	2.754467	2.825680	2.891495	2.952631	3.009675	3.063109
0.3000	2.973079	3.042214	3.106097	3.165428	3.220781	3.272627
0.4000	3.167678	3.234938	3.297083	3.354799	3.408646	3.459083
0.5000	3.356208	3.421651	3.482119	3.538281	3.590681	3.639766
0.6000	3.551278	3.614858	3.673612	3.728188	3.779115	3.826829
0.7000	3.767343	3.828898	3.885792	3.938651	3.987986	4.034216
0.8000	4.030005	4.089172	4.143877	4.194716	4.242179	4.286668
0.9000	4.411913	4.467782	4.519464	4.567519	4.612403	4.654494
0.9500	4.742732	4.795924	4.845154	4.890951	4.933745	4.973892
0.9750	5.040817	5.091743	5.138897	5.182782	5.223806	5.262307
0.9900	5.400105	5.448476	5.493291	5.535020	5.574047	5.610690
0.9950	5.652328	5.699017	5.742289	5.782597	5.820307	5.855724
0.9990	6.190836	6.234215	6.274452	6.311958	6.347071	6.380070
0.9995	6.406915	6.449067	6.488177	6.524643	6.558790	6.590889
0.9999	6.880434	6.920082	6.956890	6.991229	7.023401	7.053657

P\n	20	22	24	26	28	30
0.0001	1.595868	1.703468	1.801126	1.890368	1.972413	2.048246
0.0005	1.783582	1.890416	1.987093	2.075236	2.156123	2.230775
0.0010	1.875647	1.981896	2.077934	2.165415	2.245638	2.319635
0.0050	2.125000	2.229148	2.323063	2.408455	2.486648	2.558691
0.0100	2.252791	2.355636	2.448296	2.532490	2.609547	2.680513
0.0250	2.448862	2.549498	2.640076	2.722319	2.797547	2.866800
0.0500	2.625753	2.724238	2.812829	2.893230	2.966750	3.034415
0.1000	2.839570	2.935330	3.021432	3.099550	3.170969	3.236693
0.2000	3.113340	3.205511	3.288366	3.363534	3.432252	3.495491
0.3000	3.321364	3.410792	3.491185	3.564123	3.630811	3.692188
0.4000	3.506497	3.593503	3.671730	3.742714	3.807625	3.867378
0.5000	3.685915	3.770611	3.846776	3.915903	3.979129	4.037343
0.6000	3.871692	3.954046	4.028125	4.095376	4.156902	4.213563
0.7000	4.077692	4.157522	4.229355	4.294588	4.354286	4.409280
0.8000	4.328517	4.405388	4.474592	4.537464	4.595024	4.648069
0.9000	4.694105	4.766907	4.832495	4.892122	4.946746	4.997113
0.9500	5.011689	5.081193	5.143852	5.200850	5.253094	5.301290
0.9750	5.298566	5.365277	5.425452	5.480220	5.530445	5.576798
0.9900	5.645215	5.708769	5.766138	5.818385	5.866325	5.910592
0.9950	5.889103	5.950573	6.006087	6.056666	6.103092	6.145978
0.9990	6.411187	6.468538	6.520381	6.567656	6.611084	6.651228
0.9995	6.621165	6.676980	6.727453	6.773495	6.815801	6.854919
0.9999	7.082207	7.134873	7.182535	7.226039	7.266039	7.303044

PERCENTAGE POINTS OF THE 0th QUASI-RANGE

P\n	32	34	36	38	40	50
0.0001	2.118671	2.184353	2.245845	2.303612	2.358048	2.590591
0.0005	2.300019	2.364536	2.424887	2.481541	2.534899	2.762552
0.0010	2.388241	2.452137	2.511889	2.567966	2.620769	2.845954
0.0050	2.625423	2.687528	2.745569	2.800012	2.851256	3.069616
0.0100	2.746228	2.807370	2.864498	2.918079	2.968503	3.183321
0.0250	2.930905	2.990535	3.046240	3.098477	3.147630	3.357005
0.0500	3.097040	3.155286	3.209692	3.260710	3.308716	3.513200
0.1000	3.297516	3.354083	3.406923	3.456472	3.503096	3.701734
0.2000	3.554019	3.608457	3.659314	3.707009	3.751894	3.943206
0.3000	3.749002	3.801853	3.851234	3.897552	3.941149	4.127044
0.4000	3.922697	3.974166	4.022264	4.067386	4.109863	4.291064
0.5000	4.091247	4.141409	4.188295	4.232287	4.273708	4.450482
0.6000	4.266041	4.314888	4.360553	4.403408	4.443766	4.616090
0.7000	4.460228	4.507662	4.552018	4.593654	4.632872	4.800425
0.8000	4.697229	4.743013	4.785838	4.826050	4.863937	5.025917
0.9000	5.043816	5.087334	5.128057	5.166312	5.202370	5.356687
0.9500	5.346000	5.387678	5.426697	5.463363	5.497935	5.646026
0.9750	5.619817	5.659933	5.697502	5.732818	5.766127	5.908917
0.9900	5.951695	5.990041	6.025967	6.059751	6.091626	6.228393
0.9950	6.185810	6.222982	6.257818	6.290585	6.321508	6.454269
0.9990	6.688538	6.723377	6.756044	6.786787	6.815814	6.940585
0.9995	6.891284	6.925248	6.957102	6.987085	7.015400	7.137164
0.9999	7.337461	7.369622	7.399796	7.428210	7.455053	7.570596

P\n	60	70	80	90	100	
0.0001	2.775319	2.927786	3.057128	3.169148	3.267737	
0.0005	2.943168	3.092146	3.218493	3.327905	3.424199	
0.0010	3.024532	3.171801	3.296691	3.404839	3.500024	
0.0050	3.242655	3.385324	3.506313	3.611097	3.703340	
0.0100	3.353527	3.493863	3.612885	3.715980	3.806747	
0.0250	3.522895	3.659695	3.775746	3.876294	3.964843	
0.0500	3.675244	3.808909	3.922333	4.020632	4.107228	
0.1000	3.859209	3.989161	4.099483	4.195135	4.279426	
0.2000	4.094984	4.220324	4.326797	4.419166	4.500610	
0.3000	4.274625	4.396573	4.500222	4.590182	4.669535	
0.4000	4.435016	4.554032	4.655239	4.743118	4.820666	
0.5000	4.591013	4.707269	4.806177	4.892098	4.967946	
0.6000	4.753185	4.866667	4.963266	5.047218	5.121358	
0.7000	4.933836	5.044345	5.138468	5.220308	5.292614	
0.8000	5.155024	5.262057	5.353283	5.432652	5.502811	
0.9000	5.479870	5.582115	5.669346	5.745304	5.812497	
0.9500	5.764388	5.862730	5.946701	6.019871	6.084638	
0.9750	6.023168	6.118178	6.199362	6.270146	6.332834	
0.9900	6.337964	6.429173	6.507175	6.575233	6.635542	
0.9950	6.560722	6.649396	6.725272	6.791507	6.850223	
0.9990	7.040804	7.124400	7.196010	7.258580	7.314094	
0.9995	7.235032	7.316708	7.386704	7.447885	7.502183	
0.9999	7.663588	7.741276	7.807913	7.866200	7.917964	

PERCENTAGE POINTS OF THE 1st QUASI-RANGE

P \ n	2	3	4	5	6	7
0.0001			0.000075	0.009322	0.049902	0.119575
0.0005			0.000377	0.020912	0.086002	0.180877
0.0010			0.000754	0.029647	0.108908	0.216609
0.0050			0.003776	0.067000	0.189745	0.331749
0.0100			0.007563	0.095541	0.242125	0.400604
0.0250			0.018998	0.153712	0.336645	0.517912
0.0500			0.038307	0.222048	0.435710	0.634407
0.1000			0.077924	0.324723	0.570926	0.786431
0.2000			0.161697	0.485770	0.764467	0.994952
0.3000			0.252837	0.627106	0.923401	1.160943
0.4000			0.353523	0.764001	1.071238	1.312449
0.5000			0.467063	0.904613	1.218766	1.461597
0.6000			0.598872	1.056579	1.374677	1.617559
0.7000			0.758826	1.230666	1.550044	1.791462
0.8000			0.968348	1.447940	1.765515	2.003538
0.9000			1.292551	1.770131	2.080556	2.311526
0.9500			1.583961	2.051624	2.353169	2.576824
0.9750			1.850310	2.305250	2.597607	2.814182
0.9900			2.172496	2.609525	2.890084	3.097887
0.9950			2.398059	2.821705	3.093818	3.295463
0.9990			2.875252	3.269952	3.524257	3.713081
0.9995			3.064567	3.447885	3.695270	3.879143
0.9999			3.474609	3.833970	4.066832	4.240341

P \ n	8	9	10	11	12	13
0.0001	0.206016	0.299721	0.394993	0.488709	0.579270	0.665939
0.0005	0.288331	0.398416	0.506189	0.609412	0.707223	0.799444
0.0010	0.333983	0.451419	0.564597	0.671805	0.772573	0.867003
0.0050	0.473639	0.608298	0.733627	0.849487	0.956462	1.055367
0.0100	0.553371	0.695250	0.825439	0.944605	1.053844	1.154294
0.0250	0.684853	0.835718	0.971702	1.094637	1.206316	1.308311
0.0500	0.811495	0.968434	1.108101	1.233251	1.346213	1.448880
0.1000	0.972631	1.134631	1.277080	1.403663	1.517227	1.619968
0.2000	1.188410	1.353857	1.497714	1.624557	1.737709	1.839643
0.3000	1.357193	1.523450	1.667124	1.793263	1.905438	2.006255
0.4000	1.509604	1.675563	1.818380	1.943403	2.054351	2.153909
0.5000	1.658492	1.823441	1.964944	2.088549	2.198065	2.296223
0.6000	1.813251	1.976568	2.116325	2.238194	2.346041	2.442615
0.7000	1.984958	2.145938	2.283415	2.403130	2.508965	2.603669
0.8000	2.193469	2.351067	2.485429	2.602297	2.705534	2.797862
0.9000	2.495133	2.647150	2.776578	2.889057	2.988363	3.077145
0.9500	2.754341	2.901193	3.026169	3.134756	3.230619	3.316323
0.9750	2.985993	3.128102	3.249041	3.354132	3.446921	3.529893
0.9900	3.262767	3.399183	3.515318	3.616272	3.705442	3.785207
0.9950	3.455529	3.588020	3.700859	3.798984	3.885687	3.963270
0.9990	3.863204	3.987628	4.093718	4.186068	4.267742	4.340884
0.9995	4.025443	4.146774	4.250281	4.340423	4.420175	4.491623
0.9999	4.378647	4.493515	4.591627	4.677160	4.752903	4.820814

PERCENTAGE POINTS OF THE 1st QUASI-RANGE

P\n	14	15	16	17	18	19
0.0001	0.748455	0.826821	0.901174	0.971721	1.038698	1.102346
0.0005	0.886233	0.967897	1.044801	1.117318	1.185811	1.250619
0.0010	0.955447	1.038353	1.116186	1.189397	1.258398	1.323569
0.0050	1.147038	1.232258	1.311727	1.386063	1.455803	1.521417
0.0100	1.247005	1.332903	1.412788	1.487346	1.557166	1.622752
0.0250	1.401952	1.488348	1.568424	1.642953	1.712584	1.777866
0.0500	1.542783	1.629163	1.709032	1.783221	1.852420	1.917207
0.1000	1.713608	1.799504	1.878745	1.952215	2.020637	2.084616
0.2000	1.932239	2.016957	2.094947	2.167134	2.234266	2.296963
0.3000	2.097672	2.181191	2.257992	2.329010	2.395008	2.456606
0.4000	2.244074	2.326372	2.401991	2.471876	2.536787	2.597347
0.5000	2.385042	2.466055	2.540453	2.609179	2.672992	2.732510
0.6000	2.529939	2.609548	2.682627	2.750113	2.812758	2.871176
0.7000	2.689258	2.767252	2.838828	2.904910	2.966243	3.023428
0.8000	2.881271	2.957257	3.026976	3.091336	3.151063	3.206750
0.9000	3.157333	3.230377	3.297393	3.359258	3.416673	3.470207
0.9500	3.393736	3.464260	3.528972	3.588719	3.644177	3.695894
0.9750	3.604853	3.673156	3.735843	3.793732	3.847477	3.897607
0.9900	3.857295	3.923005	3.983332	4.039059	4.090812	4.139099
0.9950	4.033409	4.097359	4.156087	4.210350	4.260756	4.307797
0.9990	4.407058	4.467434	4.522916	4.574210	4.621884	4.666397
0.9995	4.556285	4.615299	4.669542	4.719705	4.766338	4.809888
0.9999	4.882318	4.938488	4.990148	5.037948	5.082407	5.123947

P\n	20	22	24	26	28	30
0.0001	1.162901	1.275613	1.378445	1.472757	1.559688	1.640185
0.0005	1.312048	1.425868	1.529206	1.623622	1.710391	1.790542
0.0010	1.385249	1.499326	1.602689	1.696984	1.783535	1.863407
0.0050	1.583311	1.697321	1.800177	1.893697	1.979308	2.058145
0.0100	1.684539	1.798165	1.900498	1.993418	2.078389	2.156572
0.0250	1.839263	1.951946	2.053211	2.145009	2.228846	2.305905
0.0500	1.978069	2.089609	2.189695	2.280319	2.363010	2.438961
0.1000	2.144651	2.254533	2.352994	2.442051	2.523246	2.597775
0.2000	2.355738	2.463185	2.559343	2.646237	2.725403	2.798030
0.3000	2.514321	2.619763	2.714068	2.799247	2.876824	2.947977
0.4000	2.654070	2.757660	2.850272	2.933899	3.010048	3.079882
0.5000	2.788245	2.890003	2.980955	3.063071	3.137835	3.206395
0.6000	2.925872	3.025717	3.114945	3.195498	3.268837	3.336089
0.7000	3.076966	3.174687	3.262013	3.340847	3.412624	3.478447
0.8000	3.258883	3.354040	3.439078	3.515854	3.585764	3.649884
0.9000	3.520329	3.611831	3.693622	3.767486	3.834762	3.896483
0.9500	3.744323	3.832756	3.911830	3.983263	4.048346	4.108072
0.9750	3.944559	4.030319	4.107030	4.176351	4.239531	4.297527
0.9900	4.184336	4.266997	4.340972	4.407852	4.468831	4.524829
0.9950	4.351876	4.432444	4.504573	4.569805	4.629300	4.683951
0.9990	4.708129	4.784457	4.852847	4.914743	4.971232	5.023155
0.9995	4.850726	4.925438	4.992402	5.053026	5.108370	5.159252
0.9999	5.162915	5.234252	5.298237	5.356201	5.409149	5.457853

PERCENTAGE POINTS OF THE 1st QUASI-RANGE

P \ n	32	34	36	38	40	50
0.0001	1.715040	1.784921	1.850389	1.911917	1.969919	2.217741
0.0005	1.864929	1.934258	1.999119	2.060006	2.117346	2.361827
0.0010	1.937475	2.006462	2.070965	2.131490	2.188463	2.431184
0.0050	2.131127	2.199004	2.262394	2.321815	2.377701	2.615370
0.0100	2.228899	2.296129	2.358885	2.417689	2.472976	2.707942
0.0250	2.377132	2.443294	2.505020	2.562830	2.617163	2.847888
0.0500	2.509124	2.574267	2.635018	2.691899	2.745344	2.972189
0.1000	2.666589	2.730453	2.789994	2.845727	2.898082	3.120213
0.2000	2.865061	2.927250	2.985215	3.039460	3.090411	3.306540
0.3000	3.013634	3.074541	3.131304	3.184424	3.234315	3.445941
0.4000	3.144317	3.204087	3.259790	3.311915	3.360873	3.568559
0.5000	3.269653	3.328331	3.383017	3.434192	3.482259	3.686194
0.6000	3.398142	3.455705	3.509353	3.559560	3.606721	3.806852
0.7000	3.539185	3.595533	3.648053	3.697209	3.743386	3.939399
0.8000	3.709058	3.763962	3.815143	3.863054	3.908068	4.099216
0.9000	3.953459	4.006338	4.055644	4.101811	4.145196	4.329550
0.9500	4.163222	4.214419	4.262170	4.306891	4.348929	4.527655
0.9750	4.351095	4.400837	4.447243	4.490714	4.531586	4.705465
0.9900	4.576570	4.624632	4.669484	4.711512	4.751039	4.919315
0.9950	4.734461	4.781390	4.825195	4.866251	4.904870	5.069369
0.9990	5.071170	5.115804	5.157487	5.196573	5.233354	5.390193
0.9995	5.206315	5.250074	5.290948	5.329281	5.365361	5.519272
0.9999	5.502924	5.544850	5.584027	5.620784	5.655392	5.803163

P \ n	60	70	80	90	100	
0.0001	2.414509	2.576746	2.714222	2.833150	2.937709	
0.0005	2.555491	2.714966	2.850001	2.966762	3.069390	
0.0010	2.623279	2.781384	2.915219	3.030928	3.132619	
0.0050	2.803113	2.957485	3.088093	3.200981	3.300182	
0.0100	2.893421	3.045880	3.174850	3.286316	3.384267	
0.0250	3.029877	3.179420	3.305906	3.415224	3.511293	
0.0500	3.151037	3.297974	3.422256	3.529676	3.624086	
0.1000	3.295294	3.439130	3.560801	3.665979	3.758435	
0.2000	3.476876	3.616836	3.735257	3.837654	3.927691	
0.3000	3.612753	3.749848	3.865874	3.966226	4.054487	
0.4000	3.732300	3.866907	3.980859	4.079442	4.166167	
0.5000	3.847025	3.979279	4.091271	4.188185	4.273464	
0.6000	3.964739	4.094619	4.204635	4.299867	4.383689	
0.7000	4.094109	4.221429	4.329318	4.422740	4.504993	
0.8000	4.250179	4.374485	4.479871	4.571165	4.651574	
0.9000	4.475294	4.595404	4.697307	4.785639	4.863485	
0.9500	4.669098	4.785744	4.884772	4.970660	5.046388	
0.9750	4.843174	4.956827	5.053371	5.137146	5.211044	
0.9900	5.052725	5.162923	5.256598	5.337932	5.409714	
0.9950	5.199880	5.307747	5.399484	5.479169	5.549521	
0.9990	5.514819	5.617949	5.705747	5.782076	5.849514	
0.9995	5.641647	5.742963	5.829250	5.904291	5.970611	
0.9999	5.920808	6.018308	6.101416	6.173743	6.237704	

PERCENTAGE POINTS OF THE 2nd QUASI-RANGE

P \ n	2	3	4	5	6	7
0.0001					0.000047	0.006145
0.0005					0.000237	0.013799
0.0010					0.000474	0.019577
0.0050					0.002374	0.044379
0.0100					0.004757	0.063431
0.0250					0.011963	0.102524
0.0500					0.024167	0.148885
0.1000					0.049352	0.219387
0.2000					0.103230	0.331868
0.3000					0.162763	0.432330
0.4000					0.229584	0.531047
0.5000					0.306181	0.633758
0.6000					0.396642	0.746118
0.7000					0.508454	0.876387
0.8000					0.657948	1.041017
0.9000					0.895087	1.288678
0.9500					1.113259	1.507891
0.9750					1.316074	1.707236
0.9900					1.564973	1.948257
0.9950					1.741160	2.117321
0.9990					2.118073	2.476589
0.9995					2.268892	2.619843
0.9999					2.597534	2.931644

P \ n	8	9	10	11	12	13
0.0001	0.034194	0.084649	0.149916	0.223248	0.300096	0.377642
0.0005	0.059081	0.128520	0.210707	0.298059	0.386216	0.472804
0.0010	0.074937	0.154232	0.244623	0.338471	0.431695	0.522231
0.0050	0.131278	0.237756	0.349211	0.458963	0.564169	0.663776
0.0100	0.168096	0.288167	0.409447	0.526270	0.636607	0.739976
0.0250	0.235120	0.374794	0.509539	0.635706	0.752624	0.860690
0.0500	0.306130	0.461680	0.606762	0.739818	0.861418	0.972704
0.1000	0.404225	0.576228	0.731494	0.871052	0.996884	1.110945
0.2000	0.546757	0.735243	0.900085	1.045390	1.174699	1.290824
0.3000	0.665464	0.863188	1.033014	1.181048	1.311799	1.428591
0.4000	0.777071	0.980880	1.153723	1.303205	1.434534	1.551397
0.5000	0.889464	1.097485	1.272170	1.422320	1.553689	1.670241
0.6000	1.009230	1.220111	1.395761	1.545972	1.676940	1.792847
0.7000	1.145013	1.357568	1.533365	1.683033	1.813132	1.928022
0.8000	1.313191	1.526075	1.701011	1.849340	1.977919	2.091239
0.9000	1.561297	1.772166	1.944359	2.089781	2.215497	2.326080
0.9500	1.777692	1.985152	2.153992	2.296277	2.419104	2.527037
0.9750	1.972780	2.176293	2.341608	2.480758	2.600786	2.706203
0.9900	2.207247	2.405295	2.565968	2.701109	2.817624	2.919928
0.9950	2.371107	2.565029	2.722293	2.854538	2.968546	3.068647
0.9990	2.718385	2.903120	3.052941	3.178950	3.287608	3.383039
0.9995	2.856674	3.037675	3.184507	3.308032	3.414572	3.508161
0.9999	3.157588	3.330475	3.470852	3.589034	3.691032	3.780685

PERCENTAGE POINTS OF THE 2nd QUASI-RANGE

P \ n	14	15	16	17	18	19
0.0001	0.454210	0.528842	0.601022	0.670505	0.737211	0.801157
0.0005	0.556595	0.637010	0.713838	0.787070	0.856809	0.923217
0.0010	0.609107	0.691945	0.770685	0.845431	0.916374	0.983741
0.0050	0.757567	0.845712	0.928545	1.006461	1.079859	1.149123
0.0100	0.836553	0.926772	1.011157	1.090231	1.164491	1.234388
0.0250	0.960647	1.053311	1.139459	1.219796	1.294943	1.365444
0.0500	1.074889	1.169088	1.256277	1.337297	1.412863	1.483588
0.1000	1.214936	1.310277	1.398147	1.479518	1.555198	1.625864
0.2000	1.395966	1.491851	1.579854	1.661075	1.736409	1.806592
0.3000	1.533915	1.629673	1.717348	1.798109	1.872898	1.942482
0.4000	1.656488	1.751827	1.838967	1.919127	1.993276	2.062201
0.5000	1.774818	1.869531	1.955983	2.035424	2.108844	2.177043
0.6000	1.896655	1.990537	2.076136	2.154723	2.227302	2.294679
0.7000	2.030752	2.123544	2.208067	2.285607	2.357175	2.423580
0.8000	2.192416	2.283703	2.366783	2.442946	2.513204	2.578364
0.9000	2.424674	2.513534	2.594339	2.668370	2.736627	2.799906
0.9500	2.623199	2.709821	2.788560	2.860677	2.927155	2.988776
0.9750	2.800088	2.884640	2.961484	3.031858	3.096725	3.156851
0.9900	3.011026	3.093060	3.167615	3.235893	3.298831	3.357173
0.9950	3.157784	3.238057	3.311016	3.377839	3.439441	3.496549
0.9990	3.468044	3.544620	3.614242	3.678028	3.736849	3.791396
0.9995	3.591543	3.666671	3.734988	3.797589	3.855327	3.908878
0.9999	3.860602	3.932644	3.998184	4.058265	4.113701	4.165136

P \ n	20	22	24	26	28	30
0.0001	0.862420	0.977345	1.082992	1.180394	1.270502	1.354163
0.0005	0.986480	1.104353	1.211933	1.310573	1.401433	1.485502
0.0010	1.047767	1.166724	1.274970	1.373994	1.465046	1.549173
0.0050	1.214610	1.335516	1.444806	1.544278	1.635379	1.719282
0.0100	1.300332	1.421764	1.531230	1.630653	1.721561	1.805177
0.0250	1.431773	1.553512	1.662869	1.761928	1.852314	1.935312
0.0500	1.549992	1.671575	1.780512	1.878999	1.968726	2.051020
0.1000	1.692084	1.813043	1.921152	2.018706	2.107454	2.188755
0.2000	1.872234	1.991863	2.098527	2.194603	2.281882	2.361750
0.3000	2.007493	2.125817	2.231172	2.325972	2.412024	2.490719
0.4000	2.126546	2.243551	2.347632	2.441218	2.526123	2.603737
0.5000	2.240672	2.356292	2.459067	2.551428	2.635187	2.711730
0.6000	2.357510	2.471616	2.572984	2.664041	2.746592	2.822014
0.7000	2.485478	2.597835	2.697601	2.787188	2.868385	2.942557
0.8000	2.639081	2.749247	2.847028	2.934808	3.014353	3.087007
0.9000	2.858853	2.965770	3.060639	3.145789	3.222945	3.293414
0.9500	3.046171	3.150265	3.242622	3.325520	3.400639	3.469252
0.9750	3.212854	3.314423	3.404548	3.485451	3.558770	3.625749
0.9900	3.411517	3.510094	3.597582	3.676133	3.747338	3.812400
0.9950	3.549751	3.646268	3.731945	3.808886	3.878645	3.942397
0.9990	3.842226	3.934482	4.016421	4.090043	4.156824	4.217883
0.9995	3.958787	4.049388	4.129878	4.202215	4.267845	4.327862
0.9999	4.213090	4.300185	4.377605	4.447220	4.510412	4.568226

PERCENTAGE POINTS OF THE 2nd QUASI-RANGE

P \ n	32	34	36	38	40	50
0.0001	1.432111	1.504981	1.573318	1.637594	1.698217	1.957439
0.0005	1.563610	1.636461	1.704648	1.768678	1.828984	2.086092
0.0010	1.627243	1.699988	1.768022	1.831866	1.891960	2.147861
0.0050	1.796946	1.869158	1.936574	1.999743	2.059127	2.311329
0.0100	1.882493	1.954319	2.021326	2.084073	2.143031	2.393151
0.0250	2.011953	2.083074	2.149362	2.211388	2.269631	2.516384
0.0500	2.126936	2.197328	2.262894	2.324210	2.381760	2.625345
0.1000	2.263686	2.333111	2.397736	2.458140	2.514810	2.754461
0.2000	2.435295	2.503388	2.566735	2.625917	2.681417	2.915946
0.3000	2.563150	2.630184	2.692528	2.750758	2.805355	3.035975
0.4000	2.675148	2.741223	2.802661	2.860036	2.913825	3.140982
0.5000	2.782140	2.847276	2.907833	2.964379	3.017386	3.241214
0.6000	2.891379	2.955541	3.015186	3.070877	3.123080	3.343503
0.7000	3.010764	3.073849	3.132490	3.187242	3.238563	3.455269
0.8000	3.153813	3.215600	3.273033	3.326658	3.376923	3.589196
0.9000	3.358212	3.418144	3.473858	3.525881	3.574650	3.780665
0.9500	3.532351	3.590718	3.644982	3.695658	3.743170	3.943950
0.9750	3.687354	3.744346	3.797341	3.846838	3.893251	4.089463
0.9900	3.872254	3.927639	3.979150	4.027270	4.072401	4.263291
0.9950	4.001057	4.055346	4.105845	4.153028	4.197287	4.384558
0.9990	4.274088	4.326127	4.374551	4.419811	4.462280	4.642137
0.9995	4.383119	4.434288	4.481911	4.526429	4.568207	4.745204
0.9999	4.621476	4.670806	4.716734	4.759682	4.799999	4.970944

P \ n	60	70	80	90	100	
0.0001	2.163278	2.332895	2.476512	2.600649	2.709699	
0.0005	2.289587	2.456960	2.598515	2.720783	2.828137	
0.0010	2.350128	2.516367	2.656900	2.778248	2.884778	
0.0050	2.510091	2.673189	2.810934	2.929808	3.034128	
0.0100	2.590044	2.751507	2.887824	3.005440	3.108645	
0.0250	2.710349	2.869291	3.003425	3.119134	3.220654	
0.0500	2.816631	2.973301	3.105485	3.219499	3.319529	
0.1000	2.942492	3.096433	3.226293	3.338296	3.436565	
0.2000	3.099821	3.250320	3.377270	3.486768	3.582848	
0.3000	3.216730	3.364665	3.489457	3.597106	3.691575	
0.4000	3.318998	3.464695	3.587610	3.693654	3.786728	
0.5000	3.416617	3.560186	3.681324	3.785850	3.877606	
0.6000	3.516247	3.657660	3.776999	3.879992	3.970418	
0.7000	3.625124	3.764203	3.881599	3.982936	4.071929	
0.8000	3.755626	3.891942	4.007042	4.106427	4.193730	
0.9000	3.942279	4.074725	4.186615	4.283273	4.368216	
0.9500	4.101552	4.230781	4.340004	4.434400	4.517388	
0.9750	4.243572	4.370003	4.476911	4.569343	4.650632	
0.9900	4.413339	4.536519	4.640737	4.730888	4.810206	
0.9950	4.531847	4.652820	4.755212	4.843815	4.921794	
0.9990	4.783775	4.900230	4.998884	5.084315	5.159552	
0.9995	4.884662	4.999373	5.096584	5.180792	5.254970	
0.9999	5.105791	5.216811	5.310966	5.392579	5.464513	

PERCENTAGE POINTS OF THE 3rd QUASI-RANGE

P\n	2	3	4	5	6	7
0.0001						
0.0005						
0.0010						
0.0050						
0.0100						
0.0250						
0.0500						
0.1000						
0.2000						
0.3000						
0.4000						
0.5000						
0.6000						
0.7000						
0.8000						
0.9000						
0.9500						
0.9750						
0.9900						
0.9950						
0.9990						
0.9995						
0.9999						

P\n	8	9	10	11	12	13
0.0001	0.000034	0.004578	0.025999	0.065554	0.118003	0.178267
0.0005	0.000172	0.010283	0.044982	0.099734	0.166274	0.238663
0.0010	0.000345	0.014594	0.057102	0.119831	0.193304	0.271414
0.0050	0.001727	0.033133	0.100327	0.185418	0.277080	0.369552
0.0100	0.003462	0.047410	0.128703	0.225224	0.325605	0.424671
0.0250	0.008710	0.076806	0.180615	0.293990	0.406653	0.514712
0.0500	0.017610	0.111832	0.235958	0.363399	0.485839	0.600820
0.1000	0.036023	0.165431	0.312956	0.455527	0.588042	0.709922
0.2000	0.075620	0.251738	0.425882	0.584483	0.727163	0.855718
0.3000	0.119691	0.329591	0.520796	0.689051	0.837560	0.969760
0.4000	0.169535	0.406746	0.610687	0.785810	0.938285	1.072840
0.5000	0.227141	0.487663	0.701795	0.882165	1.037519	1.173668
0.6000	0.295787	0.576874	0.799472	0.983972	1.141436	1.278625
0.7000	0.381494	0.681137	0.910884	1.098615	1.257536	1.395267
0.8000	0.497450	0.814058	1.049762	1.239822	1.399484	1.537166
0.9000	0.684234	1.016147	1.256196	1.447176	1.606349	1.742898
0.9500	0.858749	1.196848	1.437521	1.627538	1.785183	1.920012
0.9750	1.022942	1.362433	1.601846	1.789986	1.945631	2.078495
0.9900	1.226642	1.563996	1.800239	1.985209	2.137887	2.268022
0.9950	1.372097	1.706145	1.939382	2.121702	2.272040	2.400095
0.9990	1.686182	2.009944	2.235366	2.411282	2.556187	2.679529
0.9995	1.812806	2.131632	2.353571	2.526737	2.669360	2.790754
0.9999	2.090257	2.397381	2.611320	2.778282	2.915820	3.032907

PERCENTAGE POINTS OF THE 3rd QUASI-RANGE

P\n	14	15	16	17	18	19
0.0001	0.242683	0.308821	0.375122	0.440609	0.504685	0.567004
0.0005	0.313211	0.387719	0.460914	0.532082	0.600851	0.667059
0.0010	0.350597	0.428845	0.505061	0.578677	0.649439	0.717274
0.0050	0.460009	0.547127	0.630357	0.709551	0.784773	0.856190
0.0100	0.520138	0.611092	0.697284	0.778783	0.855809	0.928644
0.0250	0.616841	0.712791	0.802765	0.887149	0.966386	1.040919
0.0500	0.707936	0.807529	0.900192	0.986573	1.067296	1.142930
0.1000	0.821862	0.924879	1.019989	1.108123	1.190091	1.266598
0.2000	0.972136	1.078185	1.175345	1.264842	1.347684	1.424707
0.3000	1.088490	1.195996	1.294044	1.384039	1.467109	1.544166
0.4000	1.192963	1.301255	1.399696	1.489820	1.572838	1.649719
0.5000	1.294633	1.403304	1.501829	1.591843	1.674623	1.751182
0.6000	1.400016	1.508747	1.607101	1.696801	1.779176	1.855272
0.7000	1.516690	1.625156	1.723072	1.812228	1.894000	1.969461
0.8000	1.658122	1.765893	1.862991	1.951268	2.032134	2.106687
0.9000	1.862422	1.968632	2.064127	2.150810	2.230115	2.303154
0.9500	2.037778	2.142259	2.236089	2.321181	2.398974	2.470578
0.9750	2.194390	2.297111	2.389292	2.472841	2.549190	2.619442
0.9900	2.381416	2.481843	2.571915	2.653517	2.728064	2.796640
0.9950	2.511624	2.610368	2.698908	2.779111	2.852370	2.919756
0.9990	2.786908	2.881950	2.967158	3.044335	3.114828	3.179672
0.9995	2.896434	2.989975	3.073839	3.149802	3.219191	3.283022
0.9999	3.134858	3.225116	3.306054	3.379383	3.446379	3.508023

P\n	20	22	24	26	28	30
0.0001	0.627378	0.742028	0.848642	0.947697	1.039828	1.125695
0.0005	0.730664	0.850260	0.960339	1.061830	1.155671	1.242722
0.0010	0.782214	0.903811	1.015253	1.117671	1.212133	1.299589
0.0050	0.924018	1.049834	1.164026	1.268213	1.363767	1.451844
0.0100	0.997588	1.124971	1.240117	1.344853	1.440687	1.528856
0.0250	1.111166	1.240296	1.356407	1.461603	1.557565	1.645641
0.0500	1.213986	1.344109	1.460652	1.565931	1.661751	1.749540
0.1000	1.338244	1.468956	1.585572	1.690610	1.785997	1.873234
0.2000	1.496609	1.627294	1.743433	1.847738	1.942247	2.028531
0.3000	1.615964	1.746170	1.861617	1.965121	2.058782	2.144202
0.4000	1.721254	1.850774	1.965420	2.068077	2.160883	2.245461
0.5000	1.822338	1.951005	2.064743	2.166486	2.258396	2.342107
0.6000	1.925932	2.053560	2.166249	2.266969	2.357896	2.440671
0.7000	2.039471	2.165799	2.277227	2.376743	2.466533	2.548237
0.8000	2.175798	2.300385	2.410171	2.508153	2.596512	2.676882
0.9000	2.370805	2.492643	2.599903	2.695565	2.781787	2.860186
0.9500	2.536870	2.656196	2.761189	2.854795	2.939145	3.015830
0.9750	2.684463	2.801466	2.904387	2.996131	3.078795	3.153942
0.9900	2.860099	2.974271	3.074687	3.164192	3.244839	3.318155
0.9950	2.982111	3.094292	3.192956	3.280903	3.360149	3.432198
0.9990	3.239676	3.347640	3.442614	3.527291	3.603610	3.673015
0.9995	3.342093	3.448389	3.541909	3.625300	3.700471	3.768840
0.9999	3.565082	3.667787	3.758184	3.838820	3.911533	3.977690

PERCENTAGE POINTS OF THE 3rd QUASI-RANGE

P\n	32	34	36	38	40	50
0.0001	1.205920	1.281069	1.351653	1.418117	1.480856	1.749478
0.0005	1.323747	1.399413	1.470300	1.536903	1.599661	1.867325
0.0010	1.380863	1.456661	1.527596	1.594186	1.656881	1.923855
0.0050	1.533402	1.609247	1.680051	1.746384	1.808731	2.073262
0.0100	1.610380	1.686099	1.756716	1.822817	1.884899	2.147921
0.0250	1.726921	1.802295	1.872497	1.938139	1.999733	2.260182
0.0500	1.830438	1.905371	1.975095	2.040235	2.101319	2.359244
0.1000	1.953511	2.027783	2.096825	2.161279	2.221676	2.476360
0.2000	2.107818	2.181090	2.249140	2.312617	2.372061	2.622393
0.3000	2.222631	2.295062	2.362293	2.424980	2.483661	2.730595
0.4000	2.323071	2.394711	2.461182	2.523141	2.581125	2.825005
0.5000	2.418885	2.489731	2.555448	2.616687	2.673987	2.914895
0.6000	2.516562	2.586567	2.651488	2.711973	2.768559	3.006396
0.7000	2.623121	2.692180	2.756209	2.815854	2.871647	3.106098
0.8000	2.750522	2.818418	2.881357	2.939980	2.994811	3.225186
0.9000	2.932001	2.998202	3.059561	3.116708	3.170154	3.394706
0.9500	3.086067	3.150809	3.210816	3.266701	3.318969	3.538595
0.9750	3.222770	3.286215	3.345020	3.399789	3.451016	3.666306
0.9900	3.385310	3.447216	3.504601	3.558053	3.608052	3.818248
0.9950	3.498197	3.559044	3.615452	3.667998	3.717154	3.923861
0.9990	3.736608	3.795252	3.849630	3.900299	3.947710	4.147206
0.9995	3.831493	3.889276	3.942864	3.992800	4.039532	4.236225
0.9999	4.038334	4.094281	4.146180	4.194556	4.239839	4.430560

P\n	60	70	80	90	100	
0.0001	1.962927	2.138769	2.287571	2.416107	2.528946	
0.0005	2.079111	2.253159	2.400223	2.527129	2.638465	
0.0010	2.134719	2.307836	2.454022	2.580124	2.690722	
0.0050	2.281370	2.451846	2.595607	2.719509	2.828117	
0.0100	2.354504	2.523577	2.666078	2.788853	2.896450	
0.0250	2.464320	2.631201	2.771760	2.892813	2.998876	
0.0500	2.561095	2.725973	2.864783	2.984297	3.088995	
0.1000	2.675385	2.837833	2.974540	3.092219	3.195298	
0.2000	2.817750	2.977097	3.111150	3.226527	3.327585	
0.3000	2.923159	3.080174	3.212248	3.325917	3.425483	
0.4000	3.015093	3.170060	3.300404	3.412586	3.510853	
0.5000	3.102603	3.255614	3.384312	3.495083	3.592122	
0.6000	3.191667	3.342684	3.469712	3.579053	3.674850	
0.7000	3.288705	3.437554	3.562769	3.670565	3.765018	
0.8000	3.404611	3.550882	3.673948	3.779913	3.872781	
0.9000	3.569623	3.712260	3.832306	3.935703	4.026350	
0.9500	3.709725	3.849321	3.966847	4.068106	4.156905	
0.9750	3.834117	3.971055	4.086382	4.185778	4.272967	
0.9900	3.982175	4.116009	4.228771	4.325995	4.411309	
0.9950	4.085136	4.216852	4.327867	4.423611	4.507649	
0.9990	4.303010	4.430365	4.537783	4.630484	4.711896	
0.9995	4.389904	4.515567	4.621590	4.713112	4.793505	
0.9999	4.579719	4.701785	4.804841	4.893853	4.972081	

PERCENTAGE POINTS OF THE 4th QUASI-RANGE

P \ n	2	3	4	5	6	7
0.0001						
0.0005						
0.0010						
0.0050						
0.0100						
0.0250						
0.0500						
0.1000						
0.2000						
0.3000						
0.4000						
0.5000						
0.6000						
0.7000						
0.8000						
0.9000						
0.9500						
0.9750						
0.9900						
0.9950						
0.9990						
0.9995						
0.9999						

P \ n	8	9	10	11	12	13
0.0001			0.000027	0.003645	0.020969	0.053495
0.0005			0.000135	0.008191	0.036308	0.081495
0.0010			0.000271	0.011627	0.046114	0.097990
0.0050			0.001356	0.026420	0.081168	0.151994
0.0100			0.002719	0.037830	0.104247	0.184889
0.0250			0.006842	0.061368	0.146599	0.241922
0.0500			0.013841	0.089495	0.191931	0.299738
0.1000			0.028340	0.132700	0.255298	0.376844
0.2000			0.059611	0.202670	0.348818	0.485422
0.3000			0.094557	0.266186	0.427923	0.573976
0.4000			0.134257	0.329485	0.503232	0.656289
0.5000			0.180363	0.396224	0.579922	0.738586
0.6000			0.235605	0.470199	0.662516	0.825868
0.7000			0.305009	0.557145	0.757162	0.924525
0.8000			0.399625	0.668695	0.875739	1.046533
0.9000			0.553608	0.839647	1.053083	1.226556
0.9500			0.699036	0.993723	1.209790	1.383864
0.9750			0.837067	1.135785	1.352458	1.526040
0.9900			1.009735	1.309700	1.525417	1.697426
0.9950			1.133881	1.432923	1.647129	1.817549
0.9990			1.404008	1.697621	1.906977	2.073068
0.9995			1.513601	1.804094	2.011059	2.175157
0.9999			1.754903	2.037362	2.238517	2.397927

PERCENTAGE POINTS OF THE 4th QUASI-RANGE

P \ n	14	15	16	17	18	19
0.0001	0.097337	0.148491	0.203940	0.261592	0.320042	0.378360
0.0005	0.137385	0.199178	0.263738	0.329096	0.394034	0.457810
0.0010	0.159867	0.226738	0.295525	0.364379	0.432207	0.498379
0.0050	0.229787	0.309619	0.388877	0.466195	0.540890	0.612658
0.0100	0.270448	0.356355	0.440376	0.521453	0.599134	0.673293
0.0250	0.338609	0.432970	0.523473	0.609570	0.691176	0.768428
0.0500	0.405489	0.506530	0.602033	0.691922	0.776436	0.855935
0.1000	0.492195	0.600111	0.700638	0.794254	0.881564	0.963174
0.2000	0.610862	0.725766	0.831244	0.928422	1.018316	1.101804
0.3000	0.705506	0.824483	0.932748	1.031853	1.123079	1.207478
0.4000	0.792191	0.914002	1.024135	1.124476	1.216505	1.301404
0.5000	0.877878	1.001808	1.113276	1.214443	1.306957	1.392106
0.6000	0.967888	1.093443	1.205865	1.307558	1.400316	1.485516
0.7000	1.068759	1.195531	1.308578	1.410524	1.503292	1.588345
0.8000	1.192483	1.320044	1.433341	1.535206	1.627687	1.712322
0.9000	1.373472	1.501106	1.613978	1.715134	1.806743	1.890411
0.9500	1.530492	1.657407	1.769345	1.869463	1.959991	2.042572
0.9750	1.671738	1.797543	1.908307	2.007244	2.096613	2.178070
0.9900	1.841374	1.965410	2.074452	2.171740	2.259543	2.339517
0.9950	1.959957	2.082541	2.190225	2.286247	2.372870	2.451743
0.9990	2.211595	2.330679	2.435187	2.528311	2.612274	2.688694
0.9995	2.311967	2.429541	2.532704	2.624616	2.707477	2.782889
0.9999	2.530777	2.644919	2.745052	2.834255	2.914670	2.987855

P \ n	20	22	24	26	28	30
0.0001	0.435939	0.547484	0.653096	0.752371	0.845439	0.932658
0.0005	0.519988	0.638706	0.749489	0.852527	0.948351	1.037595
0.0010	0.562550	0.684322	0.797258	0.901828	0.998750	1.088778
0.0050	0.681412	0.810072	0.927732	1.035571	1.134753	1.226331
0.0100	0.743972	0.875452	0.994980	1.104058	1.204052	1.296146
0.0250	0.841559	0.976551	1.098324	1.208820	1.309682	1.402267
0.0500	0.930813	1.068228	1.191462	1.302808	1.404119	1.496882
0.1000	1.039650	1.179185	1.303586	1.415508	1.517012	1.609720
0.2000	1.179637	1.320813	1.445928	1.558002	1.659311	1.751603
0.3000	1.285918	1.427684	1.552870	1.664712	1.765610	1.857385
0.4000	1.380128	1.522034	1.647008	1.758443	1.858825	1.950027
0.5000	1.470913	1.612664	1.737230	1.848123	1.947898	2.038464
0.6000	1.564243	1.705583	1.829552	1.939760	2.038814	2.128653
0.7000	1.666816	1.807455	1.930591	2.039920	2.138089	2.227059
0.8000	1.790293	1.929797	2.051730	2.159855	2.256852	2.344698
0.9000	1.967370	2.104809	2.224713	2.330896	2.426055	2.512171
0.9500	2.118454	2.253817	2.371776	2.476151	2.569635	2.654197
0.9750	2.252870	2.386205	2.502311	2.604993	2.696927	2.780065
0.9900	2.412915	2.543669	2.657459	2.758052	2.848091	2.929500
0.9950	2.524112	2.652994	2.765125	2.864234	2.952936	3.033130
0.9990	2.758790	2.883586	2.992132	3.088061	3.173912	3.251531
0.9995	2.852058	2.975197	3.082302	3.176959	3.261676	3.338273
0.9999	3.054982	3.174494	3.278456	3.370351	3.452610	3.526999

PERCENTAGE POINTS OF THE 4th QUASI-RANGE

P \ n	32	34	36	38	40	50
0.0001	1.014469	1.091327	1.163671	1.231900	1.296386	1.573033
0.0005	1.120892	1.198834	1.271954	1.340728	1.405575	1.682430
0.0010	1.172633	1.250963	1.324344	1.393284	1.458223	1.734907
0.0050	1.311223	1.390216	1.463983	1.533102	1.598065	1.873567
0.0100	1.381345	1.460493	1.534306	1.603391	1.668260	1.942825
0.0250	1.487692	1.566882	1.640604	1.709502	1.774116	2.046904
0.0500	1.582302	1.661360	1.734862	1.803478	1.867768	2.138669
0.1000	1.694919	1.773644	1.846740	1.914901	1.978706	2.247050
0.2000	1.836247	1.914332	1.986735	2.054176	2.117246	2.381997
0.3000	1.941452	2.018928	2.090708	2.157524	2.219974	2.481827
0.4000	2.033494	2.110360	2.181533	2.247752	2.309619	2.568811
0.5000	2.121287	2.197515	2.268064	2.333675	2.394955	2.651520
0.6000	2.210759	2.286289	2.356163	2.421124	2.481781	2.735594
0.7000	2.308324	2.383045	2.452146	2.516368	2.576319	2.827064
0.8000	2.424890	2.498593	2.566727	2.630032	2.689115	2.936121
0.9000	2.590739	2.662916	2.729616	2.791572	2.849382	3.090975
0.9500	2.731322	2.802156	2.867602	2.928385	2.985094	3.222050
0.9750	2.855877	2.925495	2.989811	3.049541	3.105266	3.338103
0.9900	3.003726	3.071882	3.134845	3.193318	3.247869	3.475825
0.9950	3.106246	3.173383	3.235405	3.293005	3.346744	3.571333
0.9990	3.322304	3.387294	3.447340	3.503111	3.555150	3.772721
0.9995	3.408118	3.472261	3.531528	3.586579	3.637951	3.852772
0.9999	3.594844	3.657162	3.714754	3.768259	3.818197	4.027127

P \ n	60	70	80	90	100	
0.0001	1.793145	1.974486	2.127884	2.260321	2.376520	
0.0005	1.901540	2.081512	2.233466	2.364493	2.479357	
0.0010	1.953392	2.132623	2.283833	2.414152	2.528355	
0.0050	2.090017	2.267073	2.416186	2.544551	2.656955	
0.0100	2.158079	2.333946	2.481951	2.609302	2.720786	
0.0250	2.260171	2.434146	2.580424	2.706216	2.816292	
0.0500	2.350021	2.522241	2.666945	2.791332	2.900149	
0.1000	2.455980	2.626036	2.768833	2.891533	2.998851	
0.2000	2.587709	2.754969	2.895334	3.015904	3.121339	
0.3000	2.685047	2.850180	2.988717	3.107698	3.211735	
0.4000	2.769796	2.933049	3.069978	3.187570	3.290388	
0.5000	2.850339	3.011782	3.147177	3.263444	3.365107	
0.6000	2.932175	3.091766	3.225596	3.340519	3.441010	
0.7000	3.021182	3.178746	3.310873	3.424336	3.523555	
0.8000	3.127273	3.282416	3.412514	3.524243	3.621958	
0.9000	3.277890	3.429595	3.556828	3.666117	3.761717	
0.9500	3.405375	3.554186	3.679015	3.786263	3.880098	
0.9750	3.518260	3.664528	3.787253	3.892716	3.985009	
0.9900	3.652252	3.795537	3.915796	4.019171	4.109663	
0.9950	3.745197	3.886438	4.005011	4.106961	4.196223	
0.9990	3.941268	4.078277	4.193365	4.292370	4.379095	
0.9995	4.019243	4.154603	4.268334	4.366193	4.451931	
0.9999	4.189158	4.320995	4.431830	4.527244	4.610878	

PERCENTAGE POINTS OF THE 5th QUASI-RANGE

P \ n	2	3	4	5	6	7
0.0001						
0.0005						
0.0010						
0.0050						
0.0100						
0.0250						
0.0500						
0.1000						
0.2000						
0.3000						
0.4000						
0.5000						
0.6000						
0.7000						
0.8000						
0.9000						
0.9500						
0.9750						
0.9900						
0.9950						
0.9990						
0.9995						
0.9999						

P \ n	8	9	10	11	12	13
0.0001					0.000022	0.003028
0.0005					0.000111	0.006805
0.0010					0.000223	0.009661
0.0050					0.001116	0.021963
0.0100					0.002238	0.031462
0.0250					0.005632	0.051083
0.0500					0.011397	0.074574
0.1000					0.023350	0.110750
0.2000					0.049177	0.169564
0.3000					0.078115	0.223185
0.4000					0.111086	0.276833
0.5000					0.149498	0.333612
0.6000					0.195689	0.396792
0.7000					0.253969	0.471360
0.8000					0.333839	0.567488
0.9000					0.464777	0.715713
0.9500					0.589421	0.850145
0.9750					0.708514	0.974723
0.9900					0.858455	1.127960
0.9950					0.966852	1.236964
0.9990					1.204205	1.472171
0.9995					1.301015	1.567139
0.9999					1.515069	1.775815

PERCENTAGE POINTS OF THE 5th QUASI-RANGE

P\n	14	15	16	17	18	19
0.0001	0.017567	0.045184	0.082846	0.127282	0.175954	0.227047
0.0005	0.030434	0.068896	0.117071	0.170967	0.227889	0.286083
0.0010	0.038668	0.082886	0.136319	0.194767	0.255554	0.317006
0.0050	0.068145	0.128785	0.196332	0.266535	0.337024	0.406478
0.0100	0.087590	0.156816	0.231334	0.307127	0.382102	0.455176
0.0250	0.123349	0.205541	0.290169	0.373850	0.455028	0.533021
0.0500	0.161733	0.255090	0.348084	0.438113	0.524175	0.605972
0.1000	0.215564	0.321405	0.423426	0.520131	0.611223	0.696866
0.2000	0.295370	0.415209	0.526978	0.630687	0.726925	0.816411
0.3000	0.363190	0.492053	0.609901	0.717857	0.817134	0.908828
0.4000	0.428005	0.563735	0.686091	0.797123	0.898548	0.991761
0.5000	0.494245	0.635631	0.761613	0.875060	0.978125	1.072460
0.6000	0.565836	0.712115	0.841153	0.956577	1.060939	1.156119
0.7000	0.648171	0.798835	0.930523	1.047595	1.152979	1.248772
0.8000	0.751743	0.906443	1.040453	1.158869	1.264999	1.361153
0.9000	0.907425	1.065875	1.201810	1.321132	1.427563	1.523636
0.9500	1.045684	1.205756	1.342258	1.461582	1.567688	1.663247
0.9750	1.172052	1.332577	1.468915	1.587760	1.693221	1.788047
0.9900	1.325812	1.485895	1.621376	1.739179	1.843521	1.937208
0.9950	1.434342	1.593606	1.728150	1.844985	1.948370	2.041127
0.9990	1.666831	1.823320	1.955182	2.069478	2.170474	2.260991
0.9995	1.760217	1.915297	2.045889	2.159030	2.258971	2.348518
0.9999	1.964747	2.116331	2.243871	2.354299	2.451798	2.539126

P\n	20	22	24	26	28	30
0.0001	0.279302	0.384116	0.486325	0.584157	0.676960	0.764631
0.0005	0.344417	0.458874	0.568166	0.671247	0.767976	0.858606
0.0010	0.378082	0.496803	0.609160	0.714468	0.812833	0.904674
0.0050	0.474171	0.602968	0.722383	0.832709	0.934679	1.029122
0.0100	0.525807	0.658975	0.781367	0.893752	0.997156	1.092600
0.0250	0.607590	0.746505	0.872716	0.987673	1.092817	1.189427
0.0500	0.683534	0.826724	0.955686	1.072429	1.178723	1.276056
0.1000	0.777403	0.924734	1.056256	1.174579	1.281821	1.379679
0.2000	0.899849	1.051066	1.184838	1.304417	1.412287	1.510364
0.3000	0.993885	1.147158	1.281998	1.402060	1.510052	1.608025
0.4000	1.077894	1.232451	1.367856	1.488068	1.595961	1.693681
0.5000	1.159354	1.314733	1.450392	1.570538	1.678178	1.775537
0.6000	1.243548	1.399403	1.535068	1.654961	1.762205	1.859087
0.7000	1.336538	1.492543	1.627955	1.747386	1.854057	1.950314
0.8000	1.449022	1.604765	1.739569	1.858225	1.964048	2.059430
0.9000	1.611181	1.765859	1.899318	2.016529	2.120890	2.214838
0.9500	1.750164	1.903419	2.035384	2.151116	2.254053	2.346644
0.9750	1.874191	2.025867	2.156293	2.270563	2.372127	2.463435
0.9900	2.022221	2.171717	2.300109	2.412499	2.512330	2.602039
0.9950	2.125246	2.273074	2.399952	2.510968	2.609546	2.698110
0.9990	2.343010	2.487013	2.610497	2.718480	2.814327	2.900414
0.9995	2.429641	2.572038	2.694120	2.800862	2.895601	2.980689
0.9999	2.618217	2.757010	2.875974	2.979978	3.072282	3.155185

PERCENTAGE POINTS OF THE 5th QUASI-RANGE

P\n	32	34	36	38	40	50
0.0001	0.847333	0.925345	0.998995	1.068614	1.134524	1.418079
0.0005	0.943548	1.023262	1.098203	1.168798	1.235436	1.520416
0.0010	0.990516	1.070898	1.146332	1.217286	1.284181	1.569533
0.0050	1.116844	1.198574	1.274959	1.346565	1.413884	1.699375
0.0100	1.181014	1.263211	1.339900	1.411686	1.479092	1.764244
0.0250	1.278604	1.361277	1.438231	1.510128	1.577531	1.861737
0.0500	1.365658	1.448547	1.525566	1.597420	1.664700	1.947686
0.1000	1.469519	1.552446	1.629363	1.701017	1.768028	2.049173
0.2000	1.600151	1.682845	1.759405	1.830617	1.897130	2.175471
0.3000	1.697561	1.779908	1.856063	1.926832	1.992880	2.268841
0.4000	1.782871	1.864815	1.940531	2.010846	2.076433	2.350143
0.5000	1.864301	1.945784	2.021023	2.090854	2.155958	2.427397
0.6000	1.947334	2.028281	2.102980	2.172274	2.236851	2.505870
0.7000	2.037913	2.118209	2.192265	2.260931	2.324898	2.591174
0.8000	2.146159	2.225601	2.298828	2.366695	2.429893	2.692777
0.9000	2.300178	2.378289	2.450246	2.516901	2.578947	2.836838
0.9500	2.430701	2.507602	2.578416	2.643995	2.705023	2.958574
0.9750	2.546294	2.622074	2.691840	2.756436	2.816540	3.066194
0.9900	2.683420	2.757828	2.826318	2.889723	2.948714	3.193704
0.9950	2.778439	2.851877	2.919469	2.982038	3.040249	3.281998
0.9990	2.978481	3.049845	3.115524	3.176321	3.232883	3.467814
0.9995	3.057849	3.128384	3.193300	3.253392	3.309301	3.541540
0.9999	3.230368	3.299099	3.362360	3.420926	3.475421	3.701857

P\n	60	70	80	90	100	
0.0001	1.644147	1.830465	1.988044	2.124035	2.243296	
0.0005	1.746150	1.931516	2.087935	2.222723	2.340808	
0.0010	1.794941	1.979754	2.135556	2.269730	2.387224	
0.0050	1.923473	2.106567	2.260587	2.393034	2.508907	
0.0100	1.987478	2.169593	2.322648	2.454189	2.569222	
0.0250	2.083444	2.263959	2.415490	2.545622	2.659363	
0.0500	2.167852	2.346848	2.496971	2.625821	2.738400	
0.1000	2.267317	2.444409	2.592805	2.720103	2.831290	
0.2000	2.390846	2.565431	2.711602	2.836926	2.946351	
0.3000	2.482019	2.654674	2.799155	2.922997	3.031109	
0.4000	2.561324	2.732253	2.875242	2.997780	3.104743	
0.5000	2.636620	2.805878	2.947433	3.068725	3.174594	
0.6000	2.713050	2.880587	3.020673	3.140695	3.245452	
0.7000	2.796085	2.961729	3.100209	3.218847	3.322396	
0.8000	2.894932	3.058298	3.194857	3.311847	3.413959	
0.9000	3.035015	3.195124	3.328955	3.443614	3.543702	
0.9500	3.153348	3.310696	3.442228	3.554928	3.653320	
0.9750	3.257944	3.412855	3.542363	3.653344	3.750252	
0.9900	3.381870	3.533906	3.661034	3.770000	3.865168	
0.9950	3.467687	3.617745	3.743240	3.850825	3.944802	
0.9990	3.648332	3.794274	3.916380	4.021103	4.112616	
0.9995	3.720027	3.864358	3.985139	4.088745	4.179297	
0.9999	3.875981	4.016856	4.134802	4.236018	4.324514	

PERCENTAGE POINTS OF THE 6th QUASI-RANGE

P \ n	14	15	16	17	18	19
0.0001	0.000019	0.002589	0.015114	0.039108	0.072115	0.111393
0.0005	0.000095	0.005819	0.026195	0.059671	0.101999	0.149783
0.0010	0.000189	0.008262	0.033289	0.071816	0.118827	0.170730
0.0050	0.000948	0.018791	0.058718	0.111725	0.171400	0.234030
0.0100	0.001901	0.026926	0.075516	0.136145	0.202130	0.269917
0.0250	0.004785	0.043745	0.106456	0.178676	0.253893	0.329033
0.0500	0.009685	0.063908	0.139735	0.222030	0.304975	0.386112
0.1000	0.019850	0.095016	0.186521	0.280210	0.371609	0.459151
0.2000	0.041844	0.145732	0.256119	0.362795	0.463504	0.557920
0.3000	0.066531	0.192118	0.315473	0.430685	0.537335	0.636033
0.4000	0.094715	0.238661	0.372367	0.494195	0.605348	0.707230
0.5000	0.127625	0.288060	0.430674	0.558058	0.672920	0.777376
0.6000	0.167301	0.343190	0.493867	0.626167	0.744246	0.850890
0.7000	0.217516	0.408466	0.566756	0.703591	0.824569	0.933133
0.8000	0.286597	0.492927	0.658745	0.799937	0.923610	1.033891
0.9000	0.400468	0.623796	0.797594	0.943188	1.069424	1.181198
0.9500	0.509519	0.743093	0.921426	1.069318	1.196722	1.309021
0.9750	0.614254	0.854106	1.034993	1.183992	1.311786	1.424079
0.9900	0.746797	0.991203	1.173620	1.322987	1.450591	1.562398
0.9950	0.843045	1.089059	1.271732	1.420850	1.547974	1.659192
0.9990	1.054903	1.301039	1.482552	1.630073	1.755450	1.864891
0.9995	1.141704	1.386916	1.567455	1.714020	1.838481	1.947056
0.9999	1.334330	1.576121	1.753792	1.897800	2.019943	2.126398

P \ n	20	22	24	26	28	30
0.0001	0.154762	0.247876	0.343528	0.437818	0.528902	0.615978
0.0005	0.200677	0.306051	0.410903	0.512111	0.608435	0.699516
0.0010	0.225175	0.336179	0.445142	0.549379	0.647957	0.740734
0.0050	0.297477	0.422356	0.541162	0.652487	0.756241	0.852838
0.0100	0.337578	0.468770	0.591921	0.706296	0.812227	0.910394
0.0250	0.402588	0.542423	0.671381	0.789750	0.898470	0.998603
0.0500	0.464378	0.610963	0.744335	0.865661	0.976394	1.077900
0.1000	0.542358	0.695859	0.833625	0.957811	1.070421	1.173153
0.2000	0.646312	0.806873	0.948949	1.075816	1.190084	1.293810
0.3000	0.727585	0.892319	1.036825	1.165109	1.280173	1.384300
0.4000	0.801089	0.968781	1.114925	1.244093	1.359587	1.463857
0.5000	0.873066	1.043029	1.190350	1.320084	1.435781	1.540028
0.6000	0.948098	1.119869	1.268042	1.398102	1.513819	1.617904
0.7000	1.031633	1.204846	1.353587	1.483745	1.599295	1.703057
0.8000	1.133486	1.307775	1.456760	1.586726	1.701848	1.805054
0.9000	1.281620	1.456398	1.605030	1.734232	1.848387	1.950531
0.9500	1.409578	1.583968	1.731770	1.859952	1.973016	2.074059
0.9750	1.524395	1.697936	1.844669	1.971717	2.083648	2.183589
0.9900	1.662068	1.834095	1.979227	2.104699	2.215121	2.313635
0.9950	1.758222	1.928931	2.072780	2.197040	2.306331	2.403795
0.9990	1.962170	2.129546	2.270330	2.391792	2.498529	2.593655
0.9995	2.043518	2.209404	2.348865	2.469145	2.574819	2.668983
0.9999	2.220909	2.383313	2.519745	2.637357	2.740653	2.832677

PERCENTAGE POINTS OF THE 6th QUASI-RANGE

P \ n	32	34	36	38	40	50
0.0001	0.698790	0.777357	0.851841	0.922468	0.989488	1.278936
0.0005	0.785410	0.866366	0.942708	1.014781	1.082926	1.375096
0.0010	0.827915	0.909851	0.986944	1.059589	1.128171	1.421293
0.0050	0.942860	1.026917	1.105591	1.179414	1.248857	1.543533
0.0100	1.001553	1.086434	1.165700	1.239942	1.309674	1.604656
0.0250	1.091151	1.177004	1.256940	1.331626	1.401633	1.696563
0.0500	1.171378	1.257849	1.338175	1.413085	1.483192	1.777623
0.1000	1.267412	1.354352	1.434926	1.509922	1.579999	1.873362
0.2000	1.388616	1.475796	1.556395	1.631265	1.701110	1.992521
0.3000	1.479243	1.566388	1.646832	1.721465	1.791017	2.080607
0.4000	1.558761	1.645744	1.725948	1.800289	1.869514	2.157298
0.5000	1.634771	1.721503	1.801398	1.875395	1.944256	2.230152
0.6000	1.712371	1.798759	1.878269	1.951860	2.020302	2.304135
0.7000	1.797112	1.883037	1.962058	2.035147	2.103086	2.384528
0.8000	1.898484	1.983752	2.062105	2.134527	2.201810	2.480233
0.9000	2.042865	2.127034	2.204307	2.275678	2.341943	2.615828
0.9500	2.165308	2.248428	2.324690	2.395094	2.460435	2.730301
0.9750	2.273784	2.355900	2.431211	2.500714	2.565201	2.831409
0.9900	2.402488	2.483344	2.557472	2.625863	2.689304	2.951085
0.9950	2.491671	2.571618	2.644899	2.712499	2.775199	3.033874
0.9990	2.679384	2.757351	2.828799	2.894695	2.955807	3.207885
0.9995	2.753834	2.830997	2.901705	2.966915	3.027391	3.276843
0.9999	2.915591	2.990985	3.060069	3.123781	3.182868	3.426621

P \ n	60	70	80	90	100	
0.0001	1.510374	1.701261	1.862703	2.001987	2.124091	
0.0005	1.606893	1.797250	1.957814	2.096096	2.217173	
0.0010	1.653074	1.843066	2.003140	2.140900	2.261455	
0.0050	1.774758	1.963491	2.122092	2.258348	2.377449	
0.0100	1.835358	2.023323	2.181101	2.316553	2.434892	
0.0250	1.926216	2.112875	2.269328	2.403515	2.520673	
0.0500	2.006119	2.191497	2.346704	2.479728	2.595814	
0.1000	2.100250	2.283982	2.437640	2.569242	2.684034	
0.2000	2.217101	2.398616	2.550246	2.680022	2.793169	
0.3000	2.303298	2.483075	2.633152	2.761544	2.873455	
0.4000	2.378234	2.556440	2.705133	2.832303	2.943129	
0.5000	2.449343	2.626015	2.773371	2.899367	3.009157	
0.6000	2.521482	2.696562	2.842541	2.967337	3.076068	
0.7000	2.599805	2.773121	2.917586	3.041069	3.148649	
0.8000	2.692968	2.864147	3.006792	3.128705	3.234912	
0.9000	2.824847	2.992946	3.132992	3.252674	3.356938	
0.9500	2.936107	3.101575	3.239417	3.357216	3.459846	
0.9750	3.034336	3.197467	3.333362	3.449504	3.550698	
0.9900	3.150575	3.310935	3.444530	3.558720	3.658229	
0.9950	3.230975	3.389420	3.521431	3.634281	3.732633	
0.9990	3.399962	3.554402	3.683113	3.793174	3.889125	
0.9995	3.466935	3.619799	3.747215	3.856185	3.951197	
0.9999	3.612428	3.761902	3.886537	3.993164	4.086164	

PERCENTAGE POINTS OF THE 7th QUASI-RANGE

P \ n	14	15	16	17	18	19
0.0001			0.000016	0.002261	0.013261	0.034472
0.0005			0.000082	0.005082	0.022991	0.052625
0.0010			0.000165	0.007216	0.029223	0.063354
0.0050			0.000824	0.016418	0.051579	0.098655
0.0100			0.001652	0.023530	0.066364	0.120288
0.0250			0.004159	0.038246	0.093628	0.158022
0.0500			0.008419	0.055906	0.122998	0.196559
0.1000			0.017261	0.083189	0.164368	0.248384
0.2000			0.036410	0.127763	0.226071	0.322155
0.3000			0.057933	0.168629	0.278838	0.382970
0.4000			0.082540	0.209724	0.329538	0.439993
0.5000			0.111322	0.253437	0.381614	0.497455
0.6000			0.146088	0.302334	0.438180	0.558866
0.7000			0.190191	0.360375	0.503581	0.628826
0.8000			0.251041	0.435697	0.586344	0.716093
0.9000			0.351767	0.552868	0.711703	0.846244
0.9500			0.448687	0.660124	0.823905	0.961194
0.9750			0.542158	0.760280	0.927109	1.065964
0.9900			0.660941	0.884390	1.053440	1.193253
0.9950			0.747516	0.973236	1.143065	1.283052
0.9990			0.938924	1.166359	1.336182	1.475476
0.9995			1.017649	1.244828	1.414142	1.552833
0.9999			1.192908	1.418133	1.585569	1.722453

P \ n	20	22	24	26	28	30
0.0001	0.063848	0.138147	0.222867	0.310820	0.398315	0.483498
0.0005	0.090369	0.179299	0.275458	0.372173	0.466383	0.556746
0.0010	0.105319	0.201286	0.302733	0.403394	0.500572	0.593188
0.0050	0.152094	0.266289	0.380884	0.491097	0.595306	0.693166
0.0100	0.179483	0.302412	0.423057	0.537541	0.644823	0.744929
0.0250	0.225697	0.361077	0.490090	0.610354	0.721718	0.824756
0.0500	0.271395	0.416948	0.552583	0.677311	0.791763	0.896966
0.1000	0.331136	0.487603	0.630132	0.759394	0.876901	0.984199
0.2000	0.413754	0.582032	0.731758	0.865602	0.986096	1.095355
0.3000	0.480312	0.656032	0.810134	0.946664	1.068833	1.179129
0.4000	0.541759	0.723082	0.880377	1.018797	1.142091	1.253036
0.5000	0.602928	0.788844	0.948674	1.088533	1.212632	1.323990
0.6000	0.667616	0.857503	1.019441	1.160434	1.285108	1.396706
0.7000	0.740606	0.934059	1.097797	1.239677	1.364727	1.476395
0.8000	0.830799	1.027560	1.192829	1.335344	1.460535	1.572060
0.9000	0.963936	1.163820	1.330259	1.472988	1.597887	1.708839
0.9500	1.080479	1.281757	1.448400	1.590776	1.715046	1.825232
0.9750	1.186046	1.387748	1.554065	1.695787	1.819259	1.928590
0.9900	1.313647	1.515020	1.680433	1.821035	1.943316	2.051455
0.9950	1.403319	1.604015	1.768525	1.908164	2.029490	2.136709
0.9990	1.594730	1.793029	1.955041	2.092259	2.211300	2.316382
0.9995	1.671456	1.868505	2.029342	2.165480	2.283531	2.387706
0.9999	1.839353	2.033231	2.191240	2.324848	2.440624	2.542740

PERCENTAGE POINTS OF THE 7th QUASI-RANGE

P \ n	32	34	36	38	40	50
0.0001	0.565485	0.643912	0.718700	0.789917	0.857713	1.152052
0.0005	0.642760	0.724342	0.801616	0.874802	0.944160	1.242619
0.0010	0.680929	0.763846	0.842158	0.916154	0.986149	1.286190
0.0050	0.784861	0.870784	0.951393	1.027152	1.098495	1.401634
0.0100	0.838284	0.925444	1.006978	1.083426	1.155282	1.459433
0.0250	0.920240	1.008953	1.091622	1.168894	1.241337	1.546417
0.0500	0.993986	1.083790	1.167226	1.245029	1.317826	1.623199
0.1000	1.082656	1.173440	1.257530	1.335750	1.408789	1.713945
0.2000	1.195089	1.286679	1.371246	1.449705	1.522812	1.826960
0.3000	1.279483	1.371409	1.456117	1.534578	1.607590	1.910538
0.4000	1.353728	1.445787	1.530486	1.608845	1.681686	1.983318
0.5000	1.424848	1.516910	1.601503	1.679681	1.752293	2.052465
0.6000	1.497590	1.589543	1.673939	1.751861	1.824179	2.122684
0.7000	1.577164	1.668883	1.752972	1.830541	1.902479	2.198985
0.8000	1.672514	1.763818	1.847430	1.924491	1.995903	2.289806
0.9000	1.808568	1.899062	1.981826	2.058023	2.128575	2.418445
0.9500	1.924132	2.013776	2.095690	2.171052	2.240790	2.527000
0.9750	2.026622	2.115410	2.196491	2.271049	2.340015	2.622835
0.9900	2.148324	2.235994	2.316007	2.389548	2.457548	2.736209
0.9950	2.232703	2.319543	2.398774	2.471579	2.538884	2.814594
0.9990	2.410385	2.495371	2.572872	2.644059	2.709849	2.979217
0.9995	2.480875	2.565092	2.641882	2.712409	2.777584	3.044403
0.9999	2.634035	2.716537	2.791748	2.860816	2.924636	3.185881

P \ n	60	70	80	90	100	
0.0001	1.388338	1.583448	1.748495	1.890867	2.015638	
0.0005	1.479992	1.675008	1.839462	1.981034	2.104927	
0.0010	1.523872	1.718717	1.882811	2.023948	2.147386	
0.0050	1.639557	1.833616	1.996548	2.136403	2.258551	
0.0100	1.697194	1.890703	2.052954	2.192108	2.313569	
0.0250	1.783633	1.976137	2.137266	2.275295	2.395683	
0.0500	1.859666	2.051133	2.211178	2.348161	2.467565	
0.1000	1.949244	2.139330	2.298002	2.433691	2.551897	
0.2000	2.060437	2.248604	2.405450	2.539455	2.656126	
0.3000	2.142449	2.329075	2.484501	2.617220	2.732730	
0.4000	2.213732	2.398946	2.553095	2.684671	2.799157	
0.5000	2.281358	2.465177	2.618084	2.748558	2.862061	
0.6000	2.349944	2.532302	2.683923	2.813263	2.925761	
0.7000	2.424384	2.605110	2.755308	2.883404	2.994803	
0.8000	2.512888	2.691619	2.840097	2.966697	3.076783	
0.9000	2.638089	2.813918	2.959924	3.084388	3.192606	
0.9500	2.743630	2.916958	3.060854	3.183507	3.290149	
0.9750	2.836740	3.007833	3.149855	3.270908	3.376161	
0.9900	2.946830	3.115256	3.255056	3.374218	3.477835	
0.9950	3.022918	3.189492	3.327755	3.445615	3.548107	
0.9990	3.182674	3.345354	3.480401	3.595542	3.695691	
0.9995	3.245924	3.407064	3.540846	3.654918	3.754148	
0.9999	3.383202	3.541016	3.672069	3.783844	3.881101	

PERCENTAGE POINTS OF THE 8th QUASI-RANGE

P\n	14	15	16	17	18	19
0.0001					0.000015	0.002006
0.0005					0.000073	0.004511
0.0010					0.000145	0.006405
0.0050					0.000729	0.014576
0.0100					0.001461	0.020895
0.0250					0.003678	0.033974
0.0500					0.007446	0.049682
0.1000					0.015269	0.073976
0.2000					0.032223	0.113731
0.3000					0.051299	0.150249
0.4000					0.073133	0.187035
0.5000					0.098705	0.226234
0.6000					0.129639	0.270162
0.7000					0.168952	0.322411
0.8000					0.223318	0.390380
0.9000					0.313613	0.496458
0.9500					0.400827	0.593897
0.9750					0.485223	0.685155
0.9900					0.592845	0.798569
0.9950					0.671528	0.879963
0.9990					0.846142	1.057426
0.9995					0.918199	1.129722
0.9999					1.079059	1.289742

P\n	20	22	24	26	28	30
0.0001	0.011813	0.057282	0.124764	0.202477	0.283872	0.365475
0.0005	0.020484	0.081121	0.162053	0.250472	0.340210	0.428310
0.0010	0.026041	0.094570	0.181998	0.275392	0.368913	0.459906
0.0050	0.045986	0.136700	0.241049	0.346907	0.449659	0.547573
0.0100	0.059188	0.161405	0.273919	0.385562	0.492486	0.593462
0.0250	0.083556	0.203147	0.327378	0.447089	0.559713	0.664804
0.0500	0.109838	0.244490	0.378376	0.504540	0.621624	0.729873
0.1000	0.146914	0.298635	0.442984	0.575948	0.697626	0.809062
0.2000	0.202329	0.373690	0.529517	0.669706	0.796132	0.910770
0.3000	0.249824	0.434292	0.597471	0.742143	0.871429	0.987933
0.4000	0.295547	0.490343	0.659140	0.807151	0.938510	1.056320
0.5000	0.342597	0.546235	0.719711	0.870433	1.003424	1.122224
0.6000	0.393798	0.605439	0.783037	0.936078	1.070415	1.189986
0.7000	0.453114	0.672352	0.853745	1.008844	1.144313	1.264481
0.8000	0.528346	0.755190	0.940230	1.097203	1.233614	1.354192
0.9000	0.642636	0.877761	1.066505	1.225172	1.362249	1.482919
0.9500	0.745246	0.985311	1.176002	1.335338	1.472450	1.592816
0.9750	0.839868	1.082918	1.274552	1.433981	1.570781	1.690632
0.9900	0.955982	1.201115	1.393052	1.552075	1.688153	1.807140
0.9950	1.038533	1.284307	1.476008	1.634469	1.769855	1.888107
0.9990	1.216855	1.462205	1.652430	1.809089	1.942602	2.059011
0.9995	1.288998	1.533623	1.722955	1.878707	2.011348	2.126933
0.9999	1.447918	1.690102	1.877014	2.030495	2.161039	2.274695

PERCENTAGE POINTS OF THE 8th QUASI-RANGE

P\n	32	34	36	38	40	50
0.0001	0.445460	0.522900	0.597361	0.668690	0.736886	1.035055
0.0005	0.513384	0.594838	0.672487	0.746364	0.816607	1.120422
0.0010	0.547212	0.630404	0.709418	0.784372	0.855472	1.161561
0.0050	0.640133	0.727354	0.809486	0.886869	0.959867	1.270755
0.0100	0.688303	0.777245	0.860686	0.939069	1.012833	1.325514
0.0250	0.762666	0.853850	0.938968	1.018611	1.093320	1.408025
0.0500	0.830008	0.922848	1.009179	1.089709	1.165062	1.480945
0.1000	0.911445	1.005883	1.093351	1.174684	1.250593	1.567214
0.2000	1.015341	1.111278	1.199761	1.281763	1.358089	1.674762
0.3000	1.093728	1.190459	1.279438	1.361727	1.438188	1.754362
0.4000	1.162935	1.260161	1.349416	1.431826	1.508299	1.823711
0.5000	1.229422	1.326967	1.416361	1.498785	1.575188	1.889623
0.6000	1.297600	1.395328	1.484751	1.567101	1.643357	1.956575
0.7000	1.372359	1.470143	1.559483	1.641658	1.717680	2.029343
0.8000	1.462160	1.559831	1.648934	1.730789	1.806439	2.115974
0.9000	1.590645	1.687874	1.776412	1.857634	1.932609	2.238691
0.9500	1.700050	1.796684	1.884573	1.965120	2.039413	2.342244
0.9750	1.797247	1.893214	1.980420	2.060282	2.133901	2.433653
0.9900	1.912834	2.007869	2.094151	2.173115	2.245866	2.541768
0.9950	1.993063	2.087374	2.172959	2.251253	2.323365	2.616496
0.9990	2.162194	2.254820	2.338809	2.415597	2.486286	2.773376
0.9995	2.229347	2.321254	2.404572	2.480732	2.550834	2.835467
0.9999	2.375334	2.465603	2.547406	2.622160	2.690952	2.970165

P\n	60	70	80	90	100	
0.0001	1.275691	1.474719	1.643153	1.788440	1.915736	
0.0005	1.362921	1.562307	1.730441	1.875131	2.001697	
0.0010	1.404717	1.604137	1.772040	1.916387	2.042565	
0.0050	1.514998	1.714128	1.881190	2.024478	2.149530	
0.0100	1.569986	1.768790	1.935320	2.078007	2.202448	
0.0250	1.652493	1.850610	2.016219	2.157927	2.281400	
0.0500	1.725100	1.922436	2.087128	2.227906	2.350482	
0.1000	1.810673	2.006904	2.170405	2.310015	2.431489	
0.2000	1.916927	2.111547	2.273425	2.411497	2.531543	
0.3000	1.995307	2.188593	2.349187	2.486071	2.605029	
0.4000	2.063437	2.255475	2.414903	2.550721	2.668716	
0.5000	2.128070	2.318860	2.477142	2.611928	2.728992	
0.6000	2.193617	2.383082	2.540170	2.673889	2.789999	
0.7000	2.264751	2.452719	2.608477	2.741018	2.856082	
0.8000	2.349307	2.535429	2.689568	2.820688	2.934495	
0.9000	2.468884	2.652290	2.804083	2.933162	3.045174	
0.9500	2.569640	2.750681	2.900458	3.027795	3.138288	
0.9750	2.658490	2.837399	2.985377	3.111170	3.220318	
0.9900	2.763488	2.939839	3.085672	3.209634	3.317192	
0.9950	2.836020	3.010584	3.154928	3.277624	3.384087	
0.9990	2.988203	3.158987	3.300200	3.420244	3.524419	
0.9995	3.048413	3.217695	3.357671	3.476669	3.579945	
0.9999	3.179006	3.345030	3.482329	3.599074	3.700412	

Table A8

COEFFICIENTS OF w_r IN EXACT LOWER CONFIDENCE BOUNDS FOR σ WITH CONFIDENCE P (UPPER BOUNDS WITH CONFIDENCE $1-P$), BASED ON SAMPLES OF SIZE n FROM A NORMAL POPULATION

$[w_r = x_{n-r} - x_{r+1} = r$**th quasi-range of sample**$]$

COEFFICIENTS OF w_0 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	2	3	4	5	6	7
0.0001	5641.895	52.50243	10.82318	4.866452	2.992513	2.152779
0.0005	1128.379	23.47744	6.322927	3.244414	2.156566	1.632416
0.0010	564.1894	16.59896	5.013886	2.721889	1.870081	1.446451
0.0050	112.8372	7.415786	2.917986	1.802113	1.335144	1.084804
0.0100	56.41748	5.237111	2.305867	1.503725	1.150066	0.954067
0.0250	22.56389	3.299561	1.681682	1.176925	0.938129	0.799680
0.0500	11.27640	2.218021	1.316598	0.970930	0.798157	0.694376
0.1000	5.627083	1.617201	1.021069	0.792771	0.671955	0.596641
0.2000	2.791059	1.110998	0.777803	0.635550	0.555557	0.503665
0.3000	1.835113	0.878535	0.652961	0.549920	0.489709	0.449642
0.4000	1.348410	0.733893	0.569305	0.490173	0.442548	0.410222
0.5000	1.048358	0.629807	0.505479	0.443089	0.404588	0.378007
0.6000	0.840172	0.547549	0.452431	0.402832	0.371518	0.349561
0.7000	0.682250	0.477420	0.405055	0.365913	0.340651	0.322664
0.8000	0.551758	0.412621	0.359227	0.329238	0.309431	0.295100
0.9000	0.429890	0.344545	0.308599	0.287498	0.273170	0.262598
0.9500	0.360775	0.301705	0.275242	0.259225	0.248133	0.239834
0.9750	0.315475	0.271572	0.251003	0.238264	0.229310	0.222538
0.9900	0.274516	0.242701	0.227128	0.217258	0.210214	0.204827
0.9950	0.251905	0.226028	0.213034	0.204684	0.198670	0.194039
0.9990	0.214892	0.197494	0.188366	0.182357	0.177957	0.174528
0.9995	0.203147	0.188097	0.180088	0.174771	0.170857	0.167793
0.9999	0.181748	0.170527	0.164396	0.160264	0.157190	0.154765

P \ n	8	9	10	11	12	13
0.0001	1.694382	1.411017	1.220356	1.083995	0.981891	0.902675
0.0005	1.331535	1.138489	1.004804	0.906960	0.832298	0.773444
0.0010	1.197855	1.035725	0.922013	0.837939	0.773245	0.721890
0.0050	0.929989	0.825004	0.749104	0.691601	0.646455	0.610006
0.0100	0.830000	0.744388	0.681648	0.633592	0.595520	0.564547
0.0250	0.709210	0.645278	0.597544	0.560427	0.530652	0.506172
0.0500	0.624839	0.574762	0.536814	0.506950	0.482752	0.462689
0.1000	0.544826	0.506758	0.477453	0.454092	0.434961	0.418953
0.2000	0.466928	0.439344	0.417738	0.400270	0.385793	0.373557
0.3000	0.420747	0.398740	0.381307	0.367081	0.355198	0.345087
0.4000	0.386570	0.368355	0.353796	0.341826	0.331766	0.323159
0.5000	0.358315	0.343002	0.330666	0.320458	0.311832	0.304418
0.6000	0.333105	0.320192	0.309715	0.300992	0.293583	0.287186
0.7000	0.309030	0.298236	0.289414	0.282025	0.275716	0.270245
0.8000	0.284104	0.275316	0.268076	0.261973	0.256733	0.252167
0.9000	0.254366	0.247707	0.242169	0.237462	0.233392	0.229824
0.9500	0.233301	0.227972	0.223507	0.219690	0.216373	0.213451
0.9750	0.217162	0.212747	0.209029	0.205834	0.203046	0.200582
0.9900	0.200514	0.196947	0.193925	0.191316	0.189029	0.187000
0.9950	0.190311	0.187215	0.184583	0.182303	0.180300	0.178518
0.9990	0.171741	0.169408	0.167411	0.165673	0.164137	0.162766
0.9995	0.165296	0.163200	0.161401	0.159832	0.158444	0.157202
0.9999	0.152776	0.151098	0.149652	0.148385	0.147261	0.146253

COEFFICIENTS OF w_0 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	0.839449	0.787813	0.744835	0.708486	0.677326	0.650298
0.0005	0.725832	0.686491	0.653410	0.625178	0.600780	0.579466
0.0010	0.680094	0.645380	0.616056	0.590931	0.569140	0.550041
0.0050	0.579911	0.554599	0.532982	0.514278	0.497916	0.483462
0.0100	0.538805	0.517032	0.498344	0.482104	0.467839	0.455194
0.0250	0.485642	0.468140	0.453013	0.439786	0.428103	0.417696
0.0500	0.445740	0.431199	0.418560	0.407453	0.397599	0.388785
0.1000	0.405323	0.393548	0.383252	0.374155	0.366045	0.358758
0.2000	0.363047	0.353897	0.345842	0.338681	0.332262	0.326466
0.3000	0.336352	0.328708	0.321947	0.315913	0.310484	0.305565
0.4000	0.315689	0.309125	0.303298	0.298080	0.293372	0.289094
0.5000	0.297955	0.292257	0.287181	0.282623	0.278499	0.274743
0.6000	0.281589	0.276636	0.272212	0.268227	0.264612	0.261313
0.7000	0.265439	0.261172	0.257348	0.253894	0.250753	0.247880
0.8000	0.248139	0.244548	0.241320	0.238395	0.235728	0.233281
0.9000	0.226659	0.223825	0.221265	0.218937	0.216807	0.214846
0.9500	0.210849	0.208510	0.206392	0.204459	0.202686	0.201050
0.9750	0.198381	0.196396	0.194594	0.192947	0.191431	0.190031
0.9900	0.185182	0.183538	0.182040	0.180668	0.179403	0.178231
0.9950	0.176918	0.175469	0.174147	0.172933	0.171812	0.170773
0.9990	0.161529	0.160405	0.159376	0.158429	0.157553	0.156738
0.9995	0.156081	0.155061	0.154126	0.153265	0.152467	0.151725
0.9999	0.145340	0.144507	0.143742	0.143036	0.142381	0.141770

P \ n	20	22	24	26	28	30
0.0001	0.626618	0.587038	0.555208	0.528998	0.506993	0.488223
0.0005	0.560669	0.528984	0.503248	0.481873	0.463795	0.448275
0.0010	0.533149	0.504567	0.481247	0.461805	0.445308	0.431102
0.0050	0.470588	0.448602	0.430466	0.415204	0.402148	0.390825
0.0100	0.443894	0.424514	0.408447	0.394868	0.383208	0.373063
0.0250	0.408353	0.392234	0.378777	0.367334	0.357456	0.348821
0.0500	0.380843	0.367075	0.355514	0.345634	0.337069	0.329553
0.1000	0.352166	0.340677	0.330969	0.322627	0.315361	0.308957
0.2000	0.321198	0.311963	0.304102	0.297306	0.291354	0.286083
0.3000	0.301081	0.293187	0.286436	0.280574	0.275421	0.270842
0.4000	0.285185	0.278280	0.272351	0.267186	0.262631	0.258573
0.5000	0.271303	0.265209	0.259958	0.255369	0.251311	0.247688
0.6000	0.258285	0.252906	0.248254	0.244178	0.240564	0.237329
0.7000	0.245237	0.240528	0.236443	0.232851	0.229659	0.226794
0.8000	0.231026	0.226995	0.223484	0.220387	0.217627	0.215143
0.9000	0.213033	0.209780	0.206932	0.204410	0.202153	0.200116
0.9500	0.199534	0.196804	0.194407	0.192276	0.190364	0.188633
0.9750	0.188730	0.186384	0.184316	0.182474	0.180817	0.179314
0.9900	0.177141	0.175169	0.173426	0.171869	0.170464	0.169188
0.9950	0.169805	0.168051	0.166498	0.165107	0.163851	0.162708
0.9990	0.155977	0.154594	0.153365	0.152261	0.151261	0.150348
0.9995	0.151031	0.149768	0.148645	0.147634	0.146718	0.145881
0.9999	0.141199	0.140157	0.139227	0.138388	0.137627	0.136929

COEFFICIENTS OF w_0 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	0.471994	0.457801	0.445267	0.434101	0.424080	0.386012
0.0005	0.434779	0.422916	0.412390	0.402975	0.394493	0.361984
0.0010	0.418718	0.407808	0.398107	0.389413	0.381567	0.351376
0.0050	0.380891	0.372089	0.364223	0.357141	0.350723	0.325774
0.0100	0.364136	0.356205	0.349101	0.342691	0.336870	0.314137
0.0250	0.341192	0.334388	0.328274	0.322739	0.317699	0.297885
0.0500	0.322889	0.316928	0.311556	0.306682	0.302232	0.284641
0.1000	0.303259	0.298144	0.293520	0.289312	0.285462	0.270144
0.2000	0.281372	0.277127	0.273275	0.269759	0.266532	0.253601
0.3000	0.266738	0.263030	0.259657	0.256571	0.253733	0.242304
0.4000	0.254927	0.251625	0.248616	0.245858	0.243317	0.233042
0.5000	0.244424	0.241464	0.238761	0.236279	0.233989	0.224695
0.6000	0.234409	0.231756	0.229329	0.227097	0.225034	0.216634
0.7000	0.224204	0.221844	0.219683	0.217692	0.215849	0.208315
0.8000	0.212891	0.210836	0.208950	0.207209	0.205595	0.198969
0.9000	0.198263	0.196567	0.195006	0.193562	0.192220	0.186683
0.9500	0.187056	0.185609	0.184274	0.183037	0.181886	0.177116
0.9750	0.177942	0.176681	0.175516	0.174434	0.173427	0.169236
0.9900	0.168019	0.166944	0.165948	0.165023	0.164160	0.160555
0.9950	0.161660	0.160695	0.159800	0.158968	0.158190	0.154936
0.9990	0.149510	0.148735	0.148016	0.147345	0.146718	0.144080
0.9995	0.145111	0.144399	0.143738	0.143121	0.142544	0.140112
0.9999	0.136287	0.135692	0.135139	0.134622	0.134137	0.132090

P \ n	60	70	80	90	100	
0.0001	0.360319	0.341555	0.327104	0.315542	0.306022	
0.0005	0.339770	0.323400	0.310704	0.300489	0.292039	
0.0010	0.330630	0.315278	0.303334	0.293700	0.285712	
0.0050	0.308389	0.295393	0.285200	0.276924	0.270027	
0.0100	0.298194	0.286216	0.276787	0.269108	0.262691	
0.0250	0.283857	0.273247	0.264848	0.257978	0.252217	
0.0500	0.272091	0.262542	0.254950	0.248717	0.243473	
0.1000	0.259120	0.250679	0.243933	0.238371	0.233676	
0.2000	0.244201	0.236949	0.231118	0.226287	0.222192	
0.3000	0.233939	0.227450	0.222211	0.217856	0.214154	
0.4000	0.225478	0.219586	0.214812	0.210832	0.207440	
0.5000	0.217817	0.212437	0.208066	0.204411	0.201290	
0.6000	0.210385	0.205479	0.201480	0.198129	0.195261	
0.7000	0.202682	0.198242	0.194611	0.191560	0.188943	
0.8000	0.193986	0.190040	0.186801	0.184072	0.181725	
0.9000	0.182486	0.179144	0.176387	0.174055	0.172043	
0.9500	0.173479	0.170569	0.168160	0.166117	0.164348	
0.9750	0.166026	0.163447	0.161307	0.159486	0.157907	
0.9900	0.157779	0.155541	0.153677	0.152086	0.150704	
0.9950	0.152422	0.150390	0.148693	0.147243	0.145981	
0.9990	0.142029	0.140363	0.138966	0.137768	0.136722	
0.9995	0.138216	0.136673	0.135378	0.134266	0.133295	
0.9999	0.130487	0.129178	0.128075	0.127126	0.126295	

COEFFICIENTS OF w_1 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	2	3	4	5	6	7
0.0001			13263.45	107.2697	20.03927	8.362937
0.0005			2652.358	47.81845	11.62765	5.528619
0.0010			1325.971	33.73029	9.182028	4.616604
0.0050			264.8610	14.92544	5.270218	3.014327
0.0100			132.2216	10.46674	4.130091	2.496233
0.0250			52.63614	6.505659	2.970485	1.930831
0.0500			26.10466	4.503533	2.295105	1.576274
0.1000			12.83304	3.079548	1.751542	1.271567
0.2000			6.184397	2.058588	1.308101	1.005074
0.3000			3.955115	1.594628	1.082953	0.861369
0.4000			2.828671	1.308899	0.933499	0.761934
0.5000			2.141038	1.105445	0.820502	0.684183
0.6000			1.669805	0.946451	0.727444	0.618215
0.7000			1.317825	0.812568	0.645143	0.558203
0.8000			1.032687	0.690636	0.566407	0.499117
0.9000			0.773664	0.564930	0.480641	0.432615
0.9500			0.631329	0.487419	0.424959	0.388075
0.9750			0.540450	0.433792	0.384970	0.355343
0.9900			0.460300	0.383212	0.346011	0.322801
0.9950			0.417004	0.354396	0.323225	0.303447
0.9990			0.347796	0.305815	0.283748	0.269318
0.9995			0.326310	0.290033	0.270616	0.257789
0.9999			0.287802	0.260826	0.245892	0.235830

P \ n	8	9	10	11	12	13
0.0001	4.853985	3.336432	2.531693	2.046209	1.726311	1.501639
0.0005	3.468233	2.509941	1.975546	1.640925	1.413981	1.250869
0.0010	2.994160	2.215237	1.771176	1.488527	1.294376	1.153399
0.0050	2.111314	1.643930	1.363090	1.177181	1.045520	0.947538
0.0100	1.807107	1.438332	1.211477	1.058644	0.948907	0.866330
0.0250	1.460168	1.196576	1.029122	0.913545	0.828970	0.764344
0.0500	1.232293	1.032595	0.902445	0.810865	0.742824	0.690188
0.1000	1.028139	0.881344	0.783036	0.712422	0.659097	0.617296
0.2000	0.841460	0.738630	0.667684	0.615552	0.575470	0.543584
0.3000	0.736815	0.656405	0.599835	0.557643	0.524814	0.498441
0.4000	0.662425	0.596814	0.549940	0.514561	0.486772	0.464272
0.5000	0.602957	0.548414	0.508920	0.478801	0.454946	0.435498
0.6000	0.551496	0.505927	0.472517	0.446789	0.426250	0.409397
0.7000	0.503789	0.465997	0.437941	0.416124	0.398571	0.384073
0.8000	0.455899	0.425339	0.402345	0.384276	0.369613	0.357416
0.9000	0.400780	0.377765	0.360156	0.346134	0.334631	0.324977
0.9500	0.363063	0.344686	0.330451	0.319004	0.309538	0.301539
0.9750	0.334897	0.319683	0.307783	0.298140	0.290114	0.283295
0.9900	0.306488	0.294188	0.284469	0.276528	0.269873	0.264186
0.9950	0.289391	0.278705	0.270208	0.263228	0.257355	0.252317
0.9990	0.258852	0.250776	0.244277	0.238888	0.234316	0.230368
0.9995	0.248420	0.241151	0.235279	0.230392	0.226235	0.222637
0.9999	0.228381	0.222543	0.217788	0.213805	0.210398	0.207434

COEFFICIENTS OF w_1 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	1.336085	1.209452	1.109664	1.029102	0.962744	0.907156
0.0005	1.128371	1.033168	0.957120	0.895000	0.843305	0.799604
0.0010	1.046631	0.963064	0.895908	0.840762	0.794661	0.755533
0.0050	0.871811	0.811518	0.762354	0.721468	0.686906	0.657282
0.0100	0.801921	0.750242	0.707820	0.672339	0.642192	0.616237
0.0250	0.713291	0.671886	0.637583	0.608660	0.583913	0.562472
0.0500	0.648179	0.613812	0.585127	0.560783	0.539834	0.521592
0.1000	0.583564	0.555709	0.532270	0.512239	0.494893	0.479705
0.2000	0.517534	0.495796	0.477339	0.461439	0.447574	0.435357
0.3000	0.476719	0.458465	0.442871	0.429367	0.417535	0.407066
0.4000	0.445618	0.429854	0.416321	0.404551	0.394199	0.385008
0.5000	0.419280	0.405506	0.393631	0.383262	0.374113	0.365964
0.6000	0.395266	0.383208	0.372769	0.363621	0.355523	0.348289
0.7000	0.371850	0.361369	0.352258	0.344245	0.337127	0.330750
0.8000	0.347069	0.338151	0.330363	0.323485	0.317353	0.311842
0.9000	0.316723	0.309561	0.303270	0.297685	0.292682	0.288167
0.9500	0.294661	0.288662	0.283369	0.278651	0.274410	0.270571
0.9750	0.277404	0.272245	0.267677	0.263593	0.259911	0.256568
0.9900	0.259249	0.254907	0.251046	0.247582	0.244450	0.241598
0.9950	0.247929	0.244060	0.240611	0.237510	0.234700	0.232137
0.9990	0.226909	0.223842	0.221096	0.218617	0.216362	0.214298
0.9995	0.219477	0.216671	0.214154	0.211878	0.209805	0.207905
0.9999	0.204821	0.202491	0.200395	0.198494	0.196757	0.195162

P \ n	20	22	24	26	28	30
0.0001	0.859918	0.783937	0.725455	0.678999	0.641154	0.609687
0.0005	0.762167	0.701327	0.653934	0.615907	0.584662	0.558490
0.0010	0.721892	0.666966	0.623951	0.589281	0.560684	0.536651
0.0050	0.631588	0.589164	0.555501	0.528068	0.505227	0.485874
0.0100	0.593634	0.556122	0.526178	0.501651	0.481142	0.463699
0.0250	0.543696	0.512309	0.487042	0.466199	0.448663	0.433669
0.0500	0.505544	0.478558	0.456685	0.438535	0.423189	0.410011
0.1000	0.466276	0.443551	0.424990	0.409492	0.396315	0.384945
0.2000	0.424495	0.405978	0.390725	0.377895	0.366918	0.357394
0.3000	0.397722	0.381714	0.368451	0.357239	0.347606	0.339216
0.4000	0.376780	0.362626	0.350844	0.340843	0.332221	0.324688
0.5000	0.358649	0.346020	0.335463	0.326470	0.318691	0.311877
0.6000	0.341778	0.330500	0.321033	0.312940	0.305919	0.299752
0.7000	0.324995	0.314992	0.306559	0.299325	0.293030	0.287485
0.8000	0.306854	0.298148	0.290776	0.284426	0.278881	0.273981
0.9000	0.284064	0.276868	0.270737	0.265429	0.260772	0.256642
0.9500	0.267071	0.260909	0.255635	0.251050	0.247014	0.243423
0.9750	0.253514	0.248119	0.243485	0.239443	0.235875	0.232692
0.9900	0.238987	0.234357	0.230363	0.226868	0.223772	0.221003
0.9950	0.229786	0.225609	0.221997	0.218828	0.216015	0.213495
0.9990	0.212399	0.209010	0.206065	0.203469	0.201157	0.199078
0.9995	0.206155	0.203028	0.200304	0.197901	0.195757	0.193827
0.9999	0.193689	0.191049	0.188742	0.186699	0.184872	0.183222

COEFFICIENTS OF w_1 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	0.583077	0.560249	0.540427	0.523035	0.507635	0.450909
0.0005	0.536213	0.516994	0.500220	0.485435	0.472289	0.423401
0.0010	0.516136	0.498390	0.482867	0.469155	0.456942	0.411322
0.0050	0.469235	0.454751	0.442010	0.430698	0.420574	0.382355
0.0100	0.448652	0.435516	0.423929	0.413618	0.404371	0.369284
0.0250	0.420675	0.409284	0.399198	0.390194	0.382093	0.351137
0.0500	0.398545	0.388460	0.379504	0.371485	0.364253	0.336452
0.1000	0.375011	0.366240	0.358424	0.351404	0.345056	0.320491
0.2000	0.349033	0.341618	0.334984	0.329006	0.323582	0.302431
0.3000	0.331825	0.325252	0.319356	0.314029	0.309184	0.290196
0.4000	0.318034	0.312101	0.306768	0.301940	0.297542	0.280225
0.5000	0.305843	0.300451	0.295594	0.291189	0.287170	0.271283
0.6000	0.294278	0.289377	0.284953	0.280934	0.277260	0.262684
0.7000	0.282551	0.278123	0.274119	0.270474	0.267138	0.253846
0.8000	0.269610	0.265677	0.262113	0.258863	0.255881	0.243949
0.9000	0.252943	0.249605	0.246570	0.243795	0.241243	0.230971
0.9500	0.240199	0.237281	0.234622	0.232186	0.229942	0.220864
0.9750	0.229827	0.227229	0.224858	0.222682	0.220673	0.212519
0.9900	0.218504	0.216233	0.214156	0.212246	0.210480	0.203280
0.9950	0.211217	0.209144	0.207246	0.205497	0.203879	0.197263
0.9990	0.197193	0.195473	0.193893	0.192435	0.191082	0.185522
0.9995	0.192074	0.190474	0.189002	0.187643	0.186381	0.181183
0.9999	0.181722	0.180348	0.179082	0.177911	0.176822	0.172320

P \ n	60	70	80	90	100	
0.0001	0.414163	0.388086	0.368430	0.352964	0.340401	
0.0005	0.391314	0.368329	0.350877	0.337068	0.325798	
0.0010	0.381202	0.359533	0.343027	0.329932	0.319222	
0.0050	0.356746	0.338125	0.323824	0.312404	0.303014	
0.0100	0.345612	0.328312	0.314976	0.304292	0.295485	
0.0250	0.330046	0.314523	0.302489	0.292807	0.284795	
0.0500	0.317356	0.303216	0.292205	0.283312	0.275932	
0.1000	0.303463	0.290771	0.280836	0.272778	0.266068	
0.2000	0.287615	0.276485	0.267719	0.260576	0.254603	
0.3000	0.276797	0.266677	0.258674	0.252129	0.246640	
0.4000	0.267931	0.258605	0.251202	0.245132	0.240029	
0.5000	0.259941	0.251302	0.244423	0.238767	0.234002	
0.6000	0.252223	0.244223	0.237833	0.232565	0.228118	
0.7000	0.244253	0.236887	0.230983	0.226104	0.221976	
0.8000	0.235284	0.228598	0.223221	0.218763	0.214981	
0.9000	0.223449	0.217609	0.212888	0.208959	0.205614	
0.9500	0.214174	0.208954	0.204718	0.201181	0.198162	
0.9750	0.206476	0.201742	0.197888	0.194661	0.191900	
0.9900	0.197913	0.193689	0.190237	0.187338	0.184853	
0.9950	0.192312	0.188404	0.185203	0.182509	0.180196	
0.9990	0.181330	0.178001	0.175262	0.172948	0.170954	
0.9995	0.177253	0.174126	0.171549	0.169368	0.167487	
0.9999	0.168896	0.166160	0.163896	0.161976	0.160315	

COEFFICIENTS OF w_2 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	2	3	4	5	6	7
0.0001					21104.27	162.7241
0.0005					4220.195	72.46820
0.0010					2109.686	51.08054
0.0050					421.2787	22.53321
0.0100					210.2269	15.76524
0.0250					83.59335	9.753771
0.0500					41.37813	6.716586
0.1000					20.26252	4.558164
0.2000					9.687144	3.013246
0.3000					6.143900	2.313047
0.4000					4.355698	1.883072
0.5000					3.266039	1.577890
0.6000					2.521167	1.340271
0.7000					1.966745	1.141049
0.8000					1.519878	0.960599
0.9000					1.117210	0.775989
0.9500					0.898264	0.663178
0.9750					0.759836	0.585742
0.9900					0.638989	0.513279
0.9950					0.574330	0.472295
0.9990					0.472127	0.403781
0.9995					0.440744	0.381702
0.9999					0.384981	0.341106

P \ n	8	9	10	11	12	13
0.0001	29.24531	11.81345	6.670399	4.479327	3.332267	2.648011
0.0005	16.92600	7.780905	4.745924	3.355042	2.589228	2.115042
0.0010	13.34462	6.483722	4.087915	2.954466	2.316449	1.914863
0.0050	7.617417	4.205997	2.863600	2.178824	1.772519	1.506533
0.0100	5.948988	3.470211	2.442320	1.900167	1.570829	1.351395
0.0250	4.253156	2.668129	1.962559	1.573055	1.328685	1.161859
0.0500	3.266581	2.166003	1.648092	1.351684	1.160877	1.028062
0.1000	2.473870	1.735423	1.367065	1.148037	1.003126	0.900135
0.2000	1.828967	1.360095	1.111006	0.956581	0.851282	0.774699
0.3000	1.502712	1.158496	0.968041	0.846706	0.762312	0.699990
0.4000	1.286883	1.019493	0.866759	0.767339	0.697090	0.644580
0.5000	1.124272	0.911174	0.786058	0.703077	0.643629	0.598716
0.6000	0.990854	0.819598	0.716455	0.646842	0.596324	0.557772
0.7000	0.873353	0.736611	0.652160	0.594165	0.551532	0.518666
0.8000	0.761504	0.655276	0.587886	0.540733	0.505582	0.478185
0.9000	0.640493	0.564281	0.514308	0.478519	0.451366	0.429908
0.9500	0.562527	0.503740	0.464254	0.435488	0.413376	0.395720
0.9750	0.506899	0.459497	0.427057	0.403103	0.384499	0.369521
0.9900	0.453053	0.415749	0.389716	0.370218	0.354909	0.342474
0.9950	0.421744	0.389859	0.367337	0.350319	0.336865	0.325877
0.9990	0.367865	0.344457	0.327553	0.314569	0.304173	0.295592
0.9995	0.350057	0.329199	0.314020	0.302295	0.292862	0.285050
0.9999	0.316697	0.300257	0.288114	0.278627	0.270927	0.264502

COEFFICIENTS OF w_2 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	2.201625	1.890924	1.663833	1.491414	1.356464	1.248195
0.0005	1.796639	1.569833	1.400878	1.270535	1.167121	1.083169
0.0010	1.641749	1.445202	1.297547	1.182828	1.091257	1.016528
0.0050	1.320015	1.182436	1.076954	0.993580	0.926047	0.870229
0.0100	1.195382	1.079014	0.988966	0.917237	0.858744	0.810118
0.0250	1.040965	0.949387	0.877609	0.819809	0.772235	0.732363
0.0500	0.930329	0.855368	0.796003	0.747777	0.707783	0.674042
0.1000	0.823089	0.763197	0.715232	0.675896	0.643005	0.615058
0.2000	0.716350	0.670308	0.632970	0.602020	0.575901	0.553528
0.3000	0.651927	0.613620	0.582293	0.556140	0.533932	0.514805
0.4000	0.603687	0.570833	0.543784	0.521070	0.501687	0.484919
0.5000	0.563438	0.534894	0.511252	0.491298	0.474193	0.459339
0.6000	0.527244	0.502377	0.481664	0.464097	0.448974	0.435791
0.7000	0.492428	0.470911	0.452885	0.437521	0.424237	0.412613
0.8000	0.456118	0.437885	0.422514	0.409342	0.397898	0.387843
0.9000	0.412427	0.397846	0.385455	0.374761	0.365413	0.357155
0.9500	0.381214	0.369028	0.358608	0.349568	0.341629	0.334585
0.9750	0.357132	0.346664	0.337669	0.329831	0.322922	0.316771
0.9900	0.332113	0.323304	0.315695	0.309034	0.303138	0.297870
0.9950	0.316678	0.308827	0.302022	0.296047	0.290745	0.285996
0.9990	0.288347	0.282118	0.276683	0.271885	0.267605	0.263755
0.9995	0.278432	0.272727	0.267738	0.263325	0.259381	0.255828
0.9999	0.259027	0.254282	0.250114	0.246411	0.243090	0.240088

P \ n	20	22	24	26	28	30
0.0001	1.159528	1.023180	0.923368	0.847175	0.787090	0.738464
0.0005	1.013705	0.905508	0.825128	0.763025	0.713555	0.673173
0.0010	0.954411	0.857101	0.784332	0.727805	0.682572	0.645506
0.0050	0.823310	0.748774	0.692134	0.647552	0.611479	0.581638
0.0100	0.769034	0.703352	0.653070	0.613251	0.580868	0.553962
0.0250	0.698435	0.643703	0.601370	0.567560	0.539865	0.516713
0.0500	0.645165	0.598238	0.561636	0.532198	0.507943	0.487562
0.1000	0.590987	0.551559	0.520521	0.495367	0.474506	0.456881
0.2000	0.534121	0.502043	0.476525	0.455663	0.438235	0.423415
0.3000	0.498134	0.470407	0.448195	0.429928	0.414590	0.401490
0.4000	0.470246	0.445722	0.425961	0.409632	0.395864	0.384063
0.5000	0.446295	0.424396	0.406658	0.391937	0.379480	0.368768
0.6000	0.424176	0.404594	0.388654	0.375370	0.364088	0.354357
0.7000	0.402337	0.384936	0.370700	0.358785	0.348628	0.339840
0.8000	0.378920	0.363736	0.351243	0.340738	0.331746	0.323938
0.9000	0.349791	0.337181	0.326729	0.317885	0.310275	0.303636
0.9500	0.328281	0.317434	0.308392	0.300705	0.294062	0.288247
0.9750	0.311250	0.301712	0.293725	0.286907	0.280996	0.275805
0.9900	0.293125	0.284893	0.277964	0.272025	0.266856	0.262302
0.9950	0.281710	0.274253	0.267957	0.262544	0.257822	0.253653
0.9990	0.260266	0.254163	0.248978	0.244496	0.240568	0.237086
0.9995	0.252603	0.246951	0.242138	0.237970	0.234310	0.231061
0.9999	0.237355	0.232548	0.228435	0.224860	0.221709	0.218903

COEFFICIENTS OF w_2 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	0.698270	0.664460	0.635599	0.610652	0.588853	0.510872
0.0005	0.639546	0.611075	0.586631	0.565394	0.546752	0.479365
0.0010	0.614536	0.588239	0.565604	0.545891	0.528552	0.465579
0.0050	0.556500	0.535000	0.516376	0.500064	0.485643	0.432652
0.0100	0.531210	0.511687	0.494725	0.479830	0.466629	0.417859
0.0250	0.497029	0.480060	0.465254	0.452205	0.440600	0.397396
0.0500	0.470160	0.455098	0.441912	0.430254	0.419858	0.380902
0.1000	0.441757	0.428612	0.417060	0.406812	0.397644	0.363047
0.2000	0.410628	0.399459	0.389600	0.380819	0.372937	0.342942
0.3000	0.390145	0.380202	0.371398	0.363536	0.356461	0.329383
0.4000	0.373811	0.364801	0.356804	0.349646	0.343192	0.318372
0.5000	0.359436	0.351213	0.343899	0.337339	0.331413	0.308526
0.6000	0.345856	0.338348	0.331654	0.325640	0.320197	0.299088
0.7000	0.332142	0.325325	0.319235	0.313751	0.308779	0.289413
0.8000	0.317077	0.310984	0.305527	0.300602	0.296128	0.278614
0.9000	0.297778	0.292556	0.287864	0.283617	0.279748	0.264504
0.9500	0.283098	0.278496	0.274350	0.270588	0.267153	0.253553
0.9750	0.271197	0.267069	0.263342	0.259954	0.256855	0.244531
0.9900	0.258248	0.254606	0.251310	0.248307	0.245555	0.234561
0.9950	0.249934	0.246588	0.243555	0.240788	0.238249	0.228073
0.9990	0.233968	0.231154	0.228595	0.226254	0.224101	0.215418
0.9995	0.228148	0.225515	0.223119	0.220925	0.218904	0.210739
0.9999	0.216381	0.214096	0.212011	0.210098	0.208333	0.201169

P \ n	60	70	80	90	100	
0.0001	0.462261	0.428652	0.403794	0.384519	0.369045	
0.0005	0.436760	0.407007	0.384835	0.367541	0.353590	
0.0010	0.425509	0.397398	0.376378	0.359939	0.346647	
0.0050	0.398392	0.374085	0.355754	0.341319	0.329584	
0.0100	0.386094	0.363437	0.346281	0.332730	0.321684	
0.0250	0.368956	0.348518	0.332953	0.320602	0.310496	
0.0500	0.355034	0.336327	0.322011	0.310607	0.301248	
0.1000	0.339848	0.322952	0.309953	0.299554	0.290988	
0.2000	0.322599	0.307662	0.296097	0.286799	0.279108	
0.3000	0.310875	0.297206	0.286578	0.278001	0.270887	
0.4000	0.301296	0.288626	0.278737	0.270735	0.264080	
0.5000	0.292687	0.280884	0.271641	0.264141	0.257891	
0.6000	0.284394	0.273399	0.264760	0.257732	0.251863	
0.7000	0.275853	0.265660	0.257626	0.251071	0.245584	
0.8000	0.266267	0.256941	0.249561	0.243521	0.238451	
0.9000	0.253660	0.245415	0.238856	0.233466	0.228926	
0.9500	0.243810	0.236363	0.230415	0.225510	0.221367	
0.9750	0.235651	0.228833	0.223368	0.218850	0.215025	
0.9900	0.226586	0.220433	0.215483	0.211377	0.207891	
0.9950	0.220661	0.214923	0.210296	0.206449	0.203178	
0.9990	0.209040	0.204072	0.200045	0.196683	0.193815	
0.9995	0.204722	0.200025	0.196210	0.193021	0.190296	
0.9999	0.195856	0.191688	0.188290	0.185440	0.182999	

COEFFICIENTS OF w_3 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	2	3	4	5	6	7
0.0001						
0.0005						
0.0010						
0.0050						
0.0100						
0.0250						
0.0500						
0.1000						
0.2000						
0.3000						
0.4000						
0.5000						
0.6000						
0.7000						
0.8000						
0.9000						
0.9500						
0.9750						
0.9900						
0.9950						
0.9990						
0.9995						
0.9999						

P \ n	8	9	10	11	12	13
0.0001	29010.40	218.4575	38.46300	15.25459	8.474352	5.609558
0.0005	5801.099	97.24362	22.23121	10.02663	6.014164	4.190003
0.0010	2899.937	68.52000	17.51261	8.345120	5.173190	3.684413
0.0050	579.0060	30.18139	9.967431	5.393214	3.609063	2.705979
0.0100	288.8885	21.09242	7.769797	4.440033	3.071202	2.354764
0.0250	114.8149	13.01990	5.536630	3.401472	2.459102	1.942835
0.0500	56.78504	8.942003	4.238039	2.751798	2.058295	1.664391
0.1000	27.75966	6.044806	3.195337	2.195260	1.700558	1.408606
0.2000	13.22393	3.972383	2.348069	1.710915	1.375207	1.168609
0.3000	8.354876	3.034064	1.920136	1.451271	1.193944	1.031183
0.4000	5.898497	2.458535	1.637501	1.272572	1.065774	0.932105
0.5000	4.402546	2.050596	1.424917	1.133575	0.963838	0.852030
0.6000	3.380811	1.733480	1.250825	1.016289	0.876089	0.782090
0.7000	2.621271	1.468134	1.097835	0.910237	0.795206	0.716709
0.8000	2.010254	1.228413	0.952597	0.806567	0.714549	0.650548
0.9000	1.461488	0.984110	0.796054	0.691001	0.622530	0.573757
0.9500	1.164484	0.835528	0.695642	0.614425	0.560167	0.520830
0.9750	0.977573	0.733981	0.624280	0.558664	0.513972	0.481117
0.9900	0.815234	0.639388	0.555482	0.503725	0.467752	0.440913
0.9950	0.728811	0.586117	0.515628	0.471320	0.440133	0.416650
0.9990	0.593056	0.497526	0.447354	0.414717	0.391208	0.373200
0.9995	0.551631	0.469124	0.424886	0.395767	0.374622	0.358326
0.9999	0.478410	0.417122	0.382948	0.359935	0.342957	0.329717

COEFFICIENTS OF w_3 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	4.120597	3.238121	2.665801	2.269588	1.981432	1.763655
0.0005	3.192738	2.579187	2.169603	1.879410	1.664305	1.499118
0.0010	2.852278	2.331843	1.979959	1.728080	1.539791	1.394168
0.0050	2.173869	1.827728	1.586402	1.409341	1.274254	1.167965
0.0100	1.922568	1.636414	1.434136	1.284054	1.168485	1.076839
0.0250	1.621163	1.402936	1.245695	1.127206	1.034783	0.960690
0.0500	1.412557	1.238346	1.110874	1.013610	0.936947	0.874944
0.1000	1.216749	1.081223	0.980403	0.902427	0.840272	0.789516
0.2000	1.028663	0.927485	0.850814	0.790613	0.742014	0.701899
0.3000	0.918704	0.836123	0.772771	0.722523	0.681613	0.647599
0.4000	0.838249	0.768489	0.714441	0.671222	0.635793	0.606164
0.5000	0.772420	0.712604	0.665855	0.628203	0.597149	0.571043
0.6000	0.714278	0.662802	0.622238	0.589344	0.562058	0.539005
0.7000	0.659331	0.615326	0.580359	0.551807	0.527983	0.507753
0.8000	0.603092	0.566286	0.536771	0.512487	0.492094	0.474679
0.9000	0.536935	0.507967	0.484466	0.464941	0.448407	0.434187
0.9500	0.490731	0.466797	0.447209	0.430815	0.416845	0.404764
0.9750	0.455708	0.435329	0.418534	0.404393	0.392281	0.381761
0.9900	0.419918	0.402926	0.388815	0.376858	0.366560	0.357572
0.9950	0.398149	0.383088	0.370520	0.359827	0.350586	0.342494
0.9990	0.358821	0.346987	0.337023	0.328479	0.321045	0.314498
0.9995	0.345252	0.334451	0.325326	0.317480	0.310637	0.304597
0.9999	0.318994	0.310066	0.302475	0.295912	0.290160	0.285061

P \ n	20	22	24	26	28	30
0.0001	1.593935	1.347658	1.178353	1.055190	0.961698	0.888340
0.0005	1.368618	1.176111	1.041299	0.941770	0.865298	0.804685
0.0010	1.278423	1.106426	0.984976	0.894718	0.824992	0.769474
0.0050	1.082230	0.952532	0.859087	0.788511	0.733263	0.688779
0.0100	1.002418	0.888912	0.806376	0.743576	0.694113	0.654084
0.0250	0.899956	0.806259	0.737242	0.684180	0.642028	0.607666
0.0500	0.823733	0.743987	0.684626	0.638598	0.601775	0.571579
0.1000	0.747248	0.680756	0.630687	0.591502	0.559911	0.533836
0.2000	0.668177	0.614517	0.573581	0.541202	0.514868	0.492968
0.3000	0.618826	0.572682	0.537167	0.508875	0.485724	0.466374
0.4000	0.580972	0.540314	0.508797	0.483541	0.462774	0.445343
0.5000	0.548746	0.512556	0.484322	0.461577	0.442792	0.426966
0.6000	0.519229	0.486959	0.461627	0.441118	0.424107	0.409723
0.7000	0.490323	0.461723	0.439131	0.420744	0.405427	0.392428
0.8000	0.459601	0.434710	0.414908	0.398700	0.385132	0.373569
0.9000	0.421798	0.401181	0.384630	0.370980	0.359481	0.349628
0.9500	0.394187	0.376478	0.362163	0.350288	0.340235	0.331584
0.9750	0.372514	0.356956	0.344307	0.333764	0.324802	0.317064
0.9900	0.349638	0.336217	0.325236	0.316036	0.308182	0.301372
0.9950	0.335333	0.323176	0.313189	0.304794	0.297606	0.291358
0.9990	0.308673	0.298718	0.290477	0.283504	0.277500	0.272256
0.9995	0.299214	0.289990	0.282334	0.275839	0.270236	0.265334
0.9999	0.280498	0.272644	0.266086	0.260497	0.255654	0.251402

COEFFICIENTS OF w_3 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	0.829242	0.780598	0.739835	0.705160	0.675285	0.571599
0.0005	0.755431	0.714585	0.680133	0.650659	0.625132	0.535525
0.0010	0.724185	0.686502	0.654623	0.627279	0.603544	0.519790
0.0050	0.652145	0.621409	0.595220	0.572612	0.552874	0.482332
0.0100	0.620971	0.593085	0.569244	0.548601	0.530532	0.465566
0.0250	0.579065	0.554848	0.534046	0.515959	0.500067	0.442442
0.0500	0.546317	0.524832	0.506305	0.490140	0.475892	0.423865
0.1000	0.511899	0.493149	0.476912	0.462689	0.450111	0.403819
0.2000	0.474424	0.458486	0.444614	0.432411	0.421574	0.381331
0.3000	0.449917	0.435718	0.423318	0.412375	0.402631	0.366221
0.4000	0.430465	0.417587	0.406309	0.396331	0.387428	0.353982
0.5000	0.413414	0.401650	0.391321	0.382163	0.373973	0.343066
0.6000	0.397368	0.386613	0.377147	0.368735	0.361199	0.332624
0.7000	0.381225	0.371446	0.362817	0.355132	0.348232	0.321947
0.8000	0.363567	0.354809	0.347059	0.340138	0.333911	0.310060
0.9000	0.341064	0.333533	0.326844	0.320851	0.315442	0.294576
0.9500	0.324037	0.317379	0.311447	0.306119	0.301298	0.282598
0.9750	0.310292	0.304301	0.298952	0.294136	0.289770	0.272754
0.9900	0.295394	0.290089	0.285339	0.281053	0.277158	0.261900
0.9950	0.285862	0.280974	0.276591	0.272628	0.269023	0.254851
0.9990	0.267622	0.263487	0.259765	0.256391	0.253311	0.241126
0.9995	0.260995	0.257117	0.253623	0.250451	0.247553	0.236059
0.9999	0.247627	0.244243	0.241186	0.238404	0.235858	0.225705

P \ n	60	70	80	90	100	
0.0001	0.509443	0.467559	0.437145	0.413889	0.395422	
0.0005	0.480975	0.443821	0.416628	0.395706	0.379008	
0.0010	0.468446	0.433306	0.407494	0.387578	0.371647	
0.0050	0.438333	0.407856	0.385266	0.367713	0.353592	
0.0100	0.424718	0.396263	0.375083	0.358570	0.345250	
0.0250	0.405791	0.380055	0.360782	0.345684	0.333458	
0.0500	0.390458	0.366841	0.349067	0.335087	0.323730	
0.1000	0.373778	0.352382	0.336186	0.323392	0.312960	
0.2000	0.354893	0.335898	0.321425	0.309931	0.300518	
0.3000	0.342096	0.324657	0.311308	0.300669	0.291930	
0.4000	0.331665	0.315451	0.302993	0.293033	0.284831	
0.5000	0.322310	0.307162	0.295481	0.286116	0.278387	
0.6000	0.313316	0.299161	0.288208	0.279404	0.272120	
0.7000	0.304071	0.290905	0.280681	0.272438	0.265603	
0.8000	0.293719	0.281620	0.272187	0.264556	0.258212	
0.9000	0.280142	0.269378	0.260939	0.254084	0.248364	
0.9500	0.269562	0.259786	0.252089	0.245815	0.240564	
0.9750	0.260816	0.251822	0.244715	0.238904	0.234029	
0.9900	0.251119	0.242954	0.236475	0.231161	0.226690	
0.9950	0.244790	0.237144	0.231061	0.226060	0.221845	
0.9990	0.232395	0.225715	0.220372	0.215960	0.212229	
0.9995	0.227795	0.221456	0.216376	0.212174	0.208616	
0.9999	0.218354	0.212685	0.208123	0.204338	0.201123	

COEFFICIENTS OF w_4 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	2	3	4	5	6	7
0.0001						
0.0005						
0.0010						
0.0050						
0.0100						
0.0250						
0.0500						
0.1000						
0.2000						
0.3000						
0.4000						
0.5000						
0.6000						
0.7000						
0.8000						
0.9000						
0.9500						
0.9750						
0.9900						
0.9950						
0.9990						
0.9995						
0.9999						

P \ n	8	9	10	11	12	13
0.0001			36944.39	274.3310	47.69050	18.69343
0.0005			7387.576	122.0821	27.54226	12.27073
0.0010			3692.975	86.00431	21.68525	10.20508
0.0050			737.2920	37.84996	12.32008	6.579210
0.0100			367.8302	26.43412	9.592589	5.408652
0.0250			146.1492	16.29525	6.821338	4.133563
0.0500			72.24900	11.17387	5.210209	3.336250
0.1000			35.28583	7.535774	3.916998	2.653619
0.2000			16.77549	4.934126	2.866825	2.060063
0.3000			10.57565	3.756771	2.336867	1.742232
0.4000			7.448393	3.035043	1.987156	1.523719
0.5000			5.544359	2.523826	1.724371	1.353939
0.6000			4.244399	2.126758	1.509398	1.210847
0.7000			3.278589	1.794864	1.320722	1.081636
0.8000			2.502348	1.495449	1.141893	0.955536
0.9000			1.806331	1.190976	0.949593	0.815291
0.9500			1.430542	1.006317	0.826590	0.722614
0.9750			1.194647	0.880448	0.739395	0.655291
0.9900			0.990359	0.763534	0.655558	0.589127
0.9950			0.881927	0.697874	0.607117	0.550191
0.9990			0.712247	0.589060	0.524390	0.482377
0.9995			0.660676	0.554295	0.497250	0.459737
0.9999			0.569832	0.490831	0.446724	0.417027

COEFFICIENTS OF w_4 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	10.27356	6.734413	4.903411	3.822746	3.124589	2.642986
0.0005	7.278790	5.020637	3.791639	3.038626	2.537855	2.184314
0.0010	6.255208	4.410383	3.383814	2.744397	2.313705	2.006504
0.0050	4.351851	3.229772	2.571504	2.145023	1.848806	1.632231
0.0100	3.697567	2.806189	2.270786	1.917720	1.669075	1.485237
0.0250	2.953260	2.309631	1.910320	1.640502	1.446809	1.301358
0.0500	2.466158	1.974217	1.661039	1.445250	1.287936	1.168313
0.1000	2.031714	1.666357	1.427270	1.259043	1.134348	1.038234
0.2000	1.637031	1.377855	1.203016	1.077096	0.982013	0.907602
0.3000	1.417423	1.212881	1.072101	0.969130	0.890409	0.828172
0.4000	1.262322	1.094090	0.976434	0.889303	0.822027	0.768401
0.5000	1.139110	0.998195	0.898250	0.823423	0.765136	0.718336
0.6000	1.033177	0.914542	0.829280	0.764784	0.714125	0.673167
0.7000	0.935665	0.836448	0.764188	0.708956	0.665207	0.629586
0.8000	0.838586	0.757551	0.697671	0.651378	0.614369	0.584002
0.9000	0.728082	0.666175	0.619587	0.583045	0.553482	0.528985
0.9500	0.653385	0.603352	0.565181	0.534913	0.510206	0.489579
0.9750	0.598180	0.556315	0.524025	0.498196	0.476960	0.459122
0.9900	0.543073	0.508800	0.482055	0.460460	0.442567	0.427439
0.9950	0.510215	0.480183	0.456574	0.437398	0.421431	0.407873
0.9990	0.452162	0.429060	0.410646	0.395521	0.382808	0.371928
0.9995	0.432532	0.411600	0.394835	0.381008	0.369348	0.359339
0.9999	0.395136	0.378083	0.364292	0.352826	0.343092	0.334688

P \ n	20	22	24	26	28	30
0.0001	2.293899	1.826538	1.531169	1.329131	1.182818	1.072204
0.0005	1.923121	1.565665	1.334243	1.172984	1.054462	0.963767
0.0010	1.777620	1.461300	1.254299	1.108859	1.001252	0.918461
0.0050	1.467540	1.234458	1.077897	0.965651	0.881249	0.815441
0.0100	1.344137	1.142267	1.005045	0.905750	0.830529	0.771518
0.0250	1.188271	1.024012	0.910478	0.827253	0.763544	0.713131
0.0500	1.074330	0.936130	0.839305	0.767573	0.712190	0.668055
0.1000	0.961862	0.848043	0.767115	0.706460	0.659191	0.621226
0.2000	0.847718	0.757109	0.691597	0.641848	0.602660	0.570906
0.3000	0.777655	0.700435	0.643969	0.600705	0.566376	0.538391
0.4000	0.724570	0.657016	0.607162	0.568685	0.537974	0.512813
0.5000	0.679850	0.620092	0.575629	0.541090	0.513374	0.490565
0.6000	0.639287	0.586310	0.546582	0.515528	0.490481	0.469781
0.7000	0.599946	0.553264	0.517976	0.490215	0.467707	0.449023
0.8000	0.558568	0.518189	0.487394	0.462994	0.443095	0.426494
0.9000	0.508293	0.475102	0.449496	0.429020	0.412192	0.398062
0.9500	0.472042	0.443692	0.421625	0.403853	0.389160	0.376762
0.9750	0.443878	0.419075	0.399631	0.383878	0.370792	0.359704
0.9900	0.414436	0.393133	0.376299	0.362575	0.351112	0.341355
0.9950	0.396179	0.376933	0.361647	0.349133	0.338646	0.329692
0.9990	0.362478	0.346790	0.334210	0.323828	0.315069	0.307547
0.9995	0.350624	0.336112	0.324433	0.314766	0.306591	0.299556
0.9999	0.327334	0.315011	0.305022	0.296705	0.289636	0.283527

COEFFICIENTS OF w_4 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	0.985737	0.916316	0.859349	0.811754	0.771375	0.635715
0.0005	0.892147	0.834144	0.786192	0.745863	0.711453	0.594378
0.0010	0.852782	0.799384	0.755091	0.717729	0.685766	0.576400
0.0050	0.762647	0.719313	0.683068	0.652272	0.625757	0.533741
0.0100	0.723932	0.684700	0.651760	0.623678	0.599427	0.514714
0.0250	0.672182	0.638210	0.609532	0.584966	0.563661	0.488543
0.0500	0.631991	0.601916	0.576415	0.554484	0.535398	0.467581
0.1000	0.589999	0.563811	0.541495	0.522220	0.505381	0.445028
0.2000	0.544589	0.522375	0.503338	0.486813	0.472312	0.419816
0.3000	0.515078	0.495312	0.478307	0.463494	0.450456	0.402929
0.4000	0.491764	0.473853	0.458393	0.444889	0.432972	0.389285
0.5000	0.471412	0.455059	0.440905	0.428509	0.417544	0.377142
0.6000	0.452333	0.437390	0.424419	0.413031	0.402936	0.365551
0.7000	0.433215	0.419631	0.407806	0.397398	0.388151	0.353724
0.8000	0.412390	0.400225	0.389601	0.380224	0.371870	0.340585
0.9000	0.385990	0.375528	0.366352	0.358221	0.350953	0.323523
0.9500	0.366123	0.356868	0.348723	0.341485	0.334998	0.310361
0.9750	0.350155	0.341822	0.334469	0.327918	0.322034	0.299571
0.9900	0.332920	0.325533	0.318995	0.313154	0.307894	0.287701
0.9950	0.321932	0.315121	0.309080	0.303674	0.298798	0.280007
0.9990	0.300996	0.295221	0.290079	0.285461	0.281282	0.265061
0.9995	0.293417	0.287997	0.283164	0.278817	0.274880	0.259553
0.9999	0.278176	0.273436	0.269197	0.265375	0.261904	0.248316

P \ n	60	70	80	90	100	
0.0001	0.557679	0.506461	0.469950	0.442415	0.420783	
0.0005	0.525890	0.480420	0.447735	0.422924	0.403330	
0.0010	0.511930	0.468906	0.437860	0.414224	0.395514	
0.0050	0.478465	0.441097	0.413875	0.392997	0.376371	
0.0100	0.463375	0.428459	0.402909	0.383244	0.367541	
0.0250	0.442444	0.410822	0.387533	0.369520	0.355077	
0.0500	0.425528	0.396473	0.374961	0.358252	0.344810	
0.1000	0.407169	0.380802	0.361163	0.345837	0.333461	
0.2000	0.386442	0.362980	0.345383	0.331576	0.320375	
0.3000	0.372433	0.350855	0.334592	0.321782	0.311358	
0.4000	0.361037	0.340942	0.325735	0.313719	0.303916	
0.5000	0.350835	0.332029	0.317745	0.306425	0.297167	
0.6000	0.341044	0.323440	0.310020	0.299355	0.290612	
0.7000	0.330996	0.314589	0.302035	0.292027	0.283804	
0.8000	0.319767	0.304654	0.293039	0.283749	0.276094	
0.9000	0.305074	0.291580	0.281149	0.272768	0.265836	
0.9500	0.293653	0.281358	0.271812	0.264113	0.257725	
0.9750	0.284231	0.272886	0.264044	0.256890	0.250940	
0.9900	0.273804	0.263467	0.255376	0.248808	0.243329	
0.9950	0.267009	0.257305	0.249687	0.243489	0.238310	
0.9990	0.253725	0.245202	0.238472	0.232972	0.228358	
0.9995	0.248803	0.240697	0.234283	0.229032	0.224622	
0.9999	0.238711	0.231428	0.225640	0.220885	0.216878	

COEFFICIENTS OF w_5 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P\n	2	3	4	5	6	7
0.0001						
0.0005						
0.0010						
0.0050						
0.0100						
0.0250						
0.0500						
0.1000						
0.2000						
0.3000						
0.4000						
0.5000						
0.6000						
0.7000						
0.8000						
0.9000						
0.9500						
0.9750						
0.9900						
0.9950						
0.9990						
0.9995						
0.9999						

P\n	8	9	10	11	12	13
0.0001					44892.77	330.2846
0.0005					8976.932	146.9567
0.0010					4487.452	103.5142
0.0050					895.8665	45.53020
0.0100					446.9166	31.78418
0.0250					177.5421	19.57594
0.0500					87.74250	13.40949
0.1000					42.82706	9.029311
0.2000					20.33477	5.897479
0.3000					12.80156	4.480578
0.4000					9.002069	3.612285
0.5000					6.689040	2.997495
0.6000					5.110160	2.520211
0.7000					3.937487	2.121519
0.8000					2.995458	1.762152
0.9000					2.151568	1.397209
0.9500					1.696579	1.176270
0.9750					1.411404	1.025932
0.9900					1.164884	0.886556
0.9950					1.034284	0.808431
0.9990					0.830423	0.679269
0.9995					0.768631	0.638105
0.9999					0.660036	0.563122

COEFFICIENTS OF w_5 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	56.92501	22.13185	12.07066	7.856579	5.683315	4.404377
0.0005	32.85750	14.51453	8.541791	5.849097	4.388101	3.495485
0.0010	25.86122	12.06474	7.335753	5.134349	3.913069	3.154517
0.0050	14.67468	7.764895	5.093402	3.751849	2.967147	2.460159
0.0100	11.41689	6.376918	4.322751	3.255983	2.617099	2.196954
0.0250	8.107054	4.865220	3.446269	2.674869	2.197668	1.876097
0.0500	6.183047	3.920180	2.872870	2.282516	1.907761	1.650241
0.1000	4.639002	3.111338	2.361690	1.922593	1.636065	1.434996
0.2000	3.385582	2.408425	1.897613	1.585573	1.375658	1.224873
0.3000	2.753382	2.032300	1.639611	1.393036	1.223789	1.100318
0.4000	2.336423	1.773883	1.457533	1.254511	1.112906	1.008307
0.5000	2.023290	1.573240	1.313003	1.142779	1.022364	0.932436
0.6000	1.767298	1.404268	1.188845	1.045394	0.942561	0.864963
0.7000	1.542802	1.251823	1.074664	0.954567	0.867318	0.800787
0.8000	1.330242	1.103213	0.961120	0.862910	0.790514	0.734671
0.9000	1.102019	0.938196	0.832078	0.756927	0.700494	0.656325
0.9500	0.956312	0.829355	0.745013	0.684190	0.637882	0.601234
0.9750	0.853204	0.750426	0.680775	0.629818	0.590590	0.559269
0.9900	0.754255	0.672995	0.616760	0.574984	0.542440	0.516207
0.9950	0.697184	0.627508	0.578653	0.542010	0.513250	0.489925
0.9990	0.599941	0.548450	0.511461	0.483214	0.460729	0.442284
0.9995	0.568112	0.522112	0.488785	0.463171	0.442679	0.425800
0.9999	0.508971	0.472516	0.445658	0.424755	0.407864	0.393836

P \ n	20	22	24	26	28	30
0.0001	3.580358	2.603383	2.056236	1.711868	1.477192	1.307820
0.0005	2.903456	2.179249	1.760049	1.489764	1.302124	1.164679
0.0010	2.644931	2.012869	1.641606	1.399643	1.230265	1.105370
0.0050	2.108943	1.658464	1.384308	1.200899	1.069886	0.971702
0.0100	1.901839	1.517509	1.279809	1.118879	1.002852	0.915248
0.0250	1.645848	1.339575	1.145848	1.012481	0.915066	0.840741
0.0500	1.462984	1.209593	1.046369	0.932463	0.848376	0.783665
0.1000	1.286334	1.081392	0.946740	0.851369	0.780140	0.724806
0.2000	1.111298	0.951415	0.843997	0.766626	0.708071	0.662092
0.3000	1.006153	0.871720	0.780032	0.713236	0.662229	0.621881
0.4000	0.927735	0.811391	0.731071	0.672012	0.626582	0.590430
0.5000	0.862549	0.760611	0.689469	0.636724	0.595884	0.563210
0.6000	0.804151	0.714590	0.651437	0.604244	0.567471	0.537898
0.7000	0.748202	0.669997	0.614268	0.572283	0.539358	0.512738
0.8000	0.690121	0.623144	0.574855	0.538148	0.509153	0.485571
0.9000	0.620663	0.566297	0.526505	0.495902	0.471500	0.451500
0.9500	0.571375	0.525370	0.491308	0.464875	0.443645	0.426140
0.9750	0.533564	0.493616	0.463759	0.440419	0.421563	0.405937
0.9900	0.494506	0.460465	0.434762	0.414508	0.398037	0.384314
0.9950	0.470534	0.439933	0.416675	0.398253	0.383208	0.370630
0.9990	0.426801	0.402089	0.383069	0.367853	0.355325	0.344778
0.9995	0.411583	0.388797	0.371179	0.357033	0.345351	0.335493
0.9999	0.381939	0.362712	0.347708	0.335573	0.325491	0.316939

COEFFICIENTS OF w_5 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	1.180174	1.080678	1.001006	0.935792	0.881427	0.705179
0.0005	1.059829	0.977267	0.910578	0.855580	0.809431	0.657715
0.0010	1.009575	0.933796	0.872348	0.821500	0.778706	0.637132
0.0050	0.895380	0.834325	0.784339	0.742630	0.707272	0.588452
0.0100	0.846730	0.791633	0.746324	0.708373	0.676090	0.566815
0.0250	0.782103	0.734604	0.695299	0.662196	0.633902	0.537133
0.0500	0.732248	0.690347	0.655494	0.626009	0.600709	0.513430
0.1000	0.680495	0.644145	0.613737	0.587884	0.565602	0.488002
0.2000	0.624941	0.594232	0.568374	0.546264	0.527112	0.459671
0.3000	0.589080	0.561827	0.538775	0.518987	0.501786	0.440754
0.4000	0.560893	0.536246	0.515323	0.497303	0.481595	0.425506
0.5000	0.536394	0.513932	0.494799	0.478273	0.463831	0.411964
0.6000	0.513523	0.493028	0.475516	0.460347	0.447057	0.399063
0.7000	0.490698	0.472097	0.456149	0.442296	0.430126	0.385925
0.8000	0.465949	0.449317	0.435004	0.422530	0.411541	0.371364
0.9000	0.434749	0.420470	0.408122	0.397314	0.387755	0.352505
0.9500	0.411404	0.398787	0.387835	0.378216	0.369683	0.338001
0.9750	0.392728	0.381377	0.371493	0.362787	0.355046	0.326137
0.9900	0.372659	0.362604	0.353817	0.346054	0.339131	0.313116
0.9950	0.359914	0.350646	0.342528	0.335341	0.328920	0.304692
0.9990	0.335742	0.327886	0.320973	0.314830	0.309321	0.288366
0.9995	0.327027	0.319654	0.313156	0.307372	0.302179	0.282363
0.9999	0.309562	0.303113	0.297410	0.292319	0.287735	0.270135

P \ n	60	70	80	90	100	
0.0001	0.608218	0.546309	0.503007	0.470802	0.445773	
0.0005	0.572688	0.517728	0.478942	0.449899	0.427203	
0.0010	0.557121	0.505113	0.468262	0.440581	0.418897	
0.0050	0.519893	0.474706	0.442363	0.417880	0.398580	
0.0100	0.503150	0.460916	0.430543	0.407467	0.389223	
0.0250	0.479975	0.441704	0.413995	0.392831	0.376030	
0.0500	0.461286	0.426103	0.400485	0.380833	0.365177	
0.1000	0.441050	0.409097	0.385683	0.367633	0.353196	
0.2000	0.418262	0.389798	0.368786	0.352494	0.339403	
0.3000	0.402898	0.376694	0.357251	0.342115	0.329912	
0.4000	0.390423	0.365998	0.347797	0.333580	0.322088	
0.5000	0.379273	0.356395	0.339278	0.325868	0.315001	
0.6000	0.368589	0.347151	0.331052	0.318401	0.308123	
0.7000	0.357643	0.337641	0.322559	0.310670	0.300988	
0.8000	0.345431	0.326979	0.313003	0.301946	0.292915	
0.9000	0.329488	0.312977	0.300395	0.290393	0.282191	
0.9500	0.317123	0.302051	0.290510	0.281300	0.273724	
0.9750	0.306942	0.293010	0.282297	0.273722	0.266649	
0.9900	0.295694	0.282973	0.273147	0.265252	0.258721	
0.9950	0.288377	0.276415	0.267148	0.259685	0.253498	
0.9990	0.274098	0.263555	0.255338	0.248688	0.243154	
0.9995	0.268815	0.258775	0.250932	0.244574	0.239275	
0.9999	0.257999	0.248951	0.241850	0.236071	0.231240	

COEFFICIENTS OF w_6 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	52849.55	386.2881	66.16455	25.57044	13.86669	8.977252
0.0005	10567.97	171.8538	38.17574	16.75843	9.803985	6.676346
0.0010	5282.768	121.0402	30.03962	13.92448	8.415563	5.857194
0.0050	1054.609	53.21776	17.03069	8.950564	5.834322	4.272956
0.0100	526.0874	37.13946	13.24229	7.345121	4.947322	3.704846
0.0250	208.9688	22.85998	9.393532	5.596735	3.938667	3.039209
0.0500	103.2532	15.64749	7.156420	4.503896	3.278952	2.589924
0.1000	50.37710	10.52449	5.361321	3.568758	2.691000	2.177931
0.2000	23.89857	6.861888	3.904432	2.756377	2.157477	1.792371
0.3000	15.03052	5.205126	3.169845	2.321880	1.861036	1.572246
0.4000	10.55799	4.190045	2.685524	2.023493	1.651943	1.413968
0.5000	7.835441	3.471498	2.321941	1.791927	1.486060	1.286378
0.6000	5.977240	2.913836	2.024838	1.597017	1.343641	1.175240
0.7000	4.597362	2.448186	1.764428	1.421280	1.212755	1.071659
0.8000	3.489217	2.028700	1.518037	1.250099	1.082708	0.967220
0.9000	2.497079	1.603087	1.253770	1.060234	0.935083	0.846598
0.9500	1.962637	1.345726	1.085274	0.935176	0.835616	0.763930
0.9750	1.627991	1.170815	0.966190	0.844600	0.762319	0.702208
0.9900	1.339052	1.008875	0.852065	0.755865	0.689374	0.640042
0.9950	1.186176	0.918224	0.786329	0.703804	0.646006	0.602703
0.9990	0.947954	0.768616	0.674513	0.613469	0.569655	0.536224
0.9995	0.875884	0.721024	0.637977	0.583424	0.543927	0.513596
0.9999	0.749440	0.634469	0.570193	0.526926	0.495063	0.470279

P \ n	20	22	24	26	28	30
0.0001	6.461522	4.034273	2.910975	2.284052	1.890711	1.623435
0.0005	4.983134	3.267424	2.433665	1.952701	1.643561	1.429560
0.0010	4.440987	2.974602	2.246474	1.820238	1.543312	1.350012
0.0050	3.361610	2.367673	1.847876	1.532598	1.322330	1.172555
0.0100	2.962282	2.133244	1.689416	1.415836	1.231183	1.098426
0.0250	2.483928	1.843581	1.489468	1.266223	1.113003	1.001399
0.0500	2.153416	1.636761	1.343482	1.155186	1.024177	0.927730
0.1000	1.843802	1.437073	1.199580	1.044047	0.934212	0.852404
0.2000	1.547240	1.239353	1.053797	0.929527	0.840277	0.772911
0.3000	1.374409	1.120676	0.964483	0.858289	0.781144	0.722387
0.4000	1.248300	1.032225	0.896921	0.803798	0.735517	0.683127
0.5000	1.145389	0.958746	0.840089	0.757528	0.696485	0.649339
0.6000	1.054743	0.892962	0.788617	0.715255	0.660581	0.618084
0.7000	0.969337	0.829982	0.738778	0.673970	0.625276	0.587179
0.8000	0.882234	0.764658	0.686455	0.630229	0.587597	0.554000
0.9000	0.780262	0.686625	0.623041	0.576624	0.541012	0.512681
0.9500	0.709432	0.631326	0.577444	0.537648	0.506838	0.482146
0.9750	0.655998	0.588950	0.542103	0.507172	0.479928	0.457962
0.9900	0.601660	0.545228	0.505248	0.475127	0.451443	0.432220
0.9950	0.568756	0.518422	0.482444	0.455158	0.433589	0.416009
0.9990	0.509640	0.469584	0.440465	0.418097	0.400235	0.385556
0.9995	0.489352	0.452611	0.425738	0.404998	0.388377	0.374675
0.9999	0.450266	0.419584	0.396866	0.379167	0.364877	0.353023

COEFFICIENTS OF w_6 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	1.431046	1.286410	1.173928	1.084049	1.010624	0.781900
0.0005	1.273220	1.154247	1.060774	0.985434	0.923424	0.727222
0.0010	1.207853	1.099081	1.013229	0.943762	0.886390	0.703585
0.0050	1.060603	0.973789	0.904494	0.847879	0.800732	0.647864
0.0100	0.998449	0.920442	0.857854	0.806489	0.763549	0.623187
0.0250	0.916463	0.849615	0.795583	0.750962	0.713454	0.589427
0.0500	0.853695	0.795008	0.747286	0.707672	0.674222	0.562549
0.1000	0.789009	0.738360	0.696900	0.662286	0.632912	0.533800
0.2000	0.720141	0.677600	0.642510	0.613021	0.587851	0.501877
0.3000	0.676021	0.638411	0.607226	0.580901	0.558342	0.480629
0.4000	0.641535	0.607628	0.579392	0.555466	0.534898	0.463543
0.5000	0.611706	0.580888	0.555124	0.533221	0.514336	0.448400
0.6000	0.583986	0.555939	0.532405	0.512332	0.494975	0.434002
0.7000	0.556448	0.531057	0.509669	0.491365	0.475492	0.419370
0.8000	0.526736	0.504095	0.484941	0.468488	0.454172	0.403188
0.9000	0.489509	0.470138	0.453657	0.439429	0.426996	0.382288
0.9500	0.461828	0.444755	0.430165	0.417520	0.406432	0.366260
0.9750	0.439796	0.424466	0.411318	0.399886	0.389833	0.353181
0.9900	0.416235	0.402683	0.391011	0.380827	0.371843	0.338858
0.9950	0.401337	0.388860	0.378086	0.368664	0.360335	0.329612
0.9990	0.373220	0.362667	0.353507	0.345460	0.338317	0.311732
0.9995	0.363130	0.353232	0.344625	0.337050	0.330317	0.305172
0.9999	0.342984	0.334338	0.326790	0.320125	0.314182	0.291833

P \ n	60	70	80	90	100	
0.0001	0.662088	0.587799	0.536854	0.499504	0.470790	
0.0005	0.622319	0.556406	0.510774	0.477077	0.451025	
0.0010	0.604934	0.542574	0.499216	0.467093	0.442193	
0.0050	0.563457	0.509297	0.471233	0.442802	0.420619	
0.0100	0.544853	0.494236	0.458484	0.431676	0.410696	
0.0250	0.519153	0.473289	0.440659	0.416057	0.396719	
0.0500	0.498475	0.456309	0.426130	0.403270	0.385236	
0.1000	0.476134	0.437832	0.410233	0.389220	0.372574	
0.2000	0.451039	0.416907	0.392119	0.373131	0.358016	
0.3000	0.434160	0.402726	0.379773	0.362116	0.348013	
0.4000	0.420480	0.391169	0.369668	0.353070	0.339774	
0.5000	0.408273	0.380805	0.360572	0.344903	0.332319	
0.6000	0.396592	0.370843	0.351798	0.337003	0.325090	
0.7000	0.384644	0.360605	0.342749	0.328832	0.317597	
0.8000	0.371337	0.349144	0.332580	0.319621	0.309127	
0.9000	0.354001	0.334119	0.319184	0.307439	0.297891	
0.9500	0.340587	0.322417	0.308698	0.297866	0.289030	
0.9750	0.329561	0.312748	0.299997	0.289897	0.281635	
0.9900	0.317402	0.302029	0.290315	0.281000	0.273356	
0.9950	0.309504	0.295036	0.283975	0.275158	0.267907	
0.9990	0.294121	0.281341	0.271509	0.263631	0.257127	
0.9995	0.288439	0.276258	0.266865	0.259324	0.253088	
0.9999	0.276822	0.265823	0.257298	0.250428	0.244728	

COEFFICIENTS OF w_7 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001			60811.62	442.3250	75.40772	29.00936
0.0005			12160.06	196.7659	43.49614	19.00255
0.0010			6078.602	138.5768	34.21975	15.78441
0.0050			1213.459	60.91019	19.38773	10.13631
0.0100			605.3116	42.49824	15.06850	8.313361
0.0250			240.4171	26.14628	10.68058	6.328223
0.0500			118.7749	17.88709	8.130208	5.087531
0.1000			57.93272	12.02079	6.083904	4.026029
0.2000			27.46526	7.827020	4.423390	3.104100
0.3000			17.26143	5.930192	3.586316	2.611170
0.4000			12.11536	4.768179	3.034553	2.272765
0.5000			8.982955	3.945754	2.620450	2.010231
0.6000			6.845181	3.307603	2.282168	1.789339
0.7000			5.257882	2.774889	1.985778	1.590266
0.8000			3.983411	2.295171	1.705484	1.396466
0.9000			2.842787	1.808749	1.405081	1.181692
0.9500			2.228723	1.514866	1.213732	1.040373
0.9750			1.844481	1.315305	1.078622	0.938118
0.9900			1.512994	1.130723	0.949271	0.838045
0.9950			1.337764	1.027500	0.874841	0.779392
0.9990			1.065049	0.857369	0.748401	0.677747
0.9995			0.982657	0.803324	0.707143	0.643984
0.9999			0.838288	0.705152	0.630688	0.580567

P \ n	20	22	24	26	28	30
0.0001	15.66219	7.238669	4.486973	3.217294	2.510574	2.068261
0.0005	11.06575	5.577270	3.630315	2.686924	2.144159	1.796150
0.0010	9.494982	4.968062	3.303246	2.478964	1.997715	1.685806
0.0050	6.574896	3.755325	2.625468	2.036257	1.679809	1.442656
0.0100	5.571549	3.306742	2.363745	1.860322	1.550813	1.342410
0.0250	4.430714	2.769489	2.040441	1.638394	1.385582	1.212480
0.0500	3.684664	2.398380	1.809683	1.476426	1.263005	1.114869
0.1000	3.019911	2.050849	1.586969	1.316840	1.140379	1.016055
0.2000	2.416894	1.718120	1.366572	1.155266	1.014100	0.912946
0.3000	2.081979	1.524315	1.234364	1.056341	0.935600	0.848084
0.4000	1.845839	1.382969	1.135877	0.981550	0.875587	0.798062
0.5000	1.658573	1.267678	1.054103	0.918668	0.824653	0.755293
0.6000	1.497866	1.166177	0.980930	0.861747	0.778145	0.715970
0.7000	1.350245	1.070596	0.910915	0.806662	0.732747	0.677326
0.8000	1.203661	0.973179	0.838343	0.748871	0.684681	0.636108
0.9000	1.037413	0.859239	0.751733	0.678892	0.625826	0.585193
0.9500	0.925515	0.780179	0.690417	0.628624	0.583075	0.547876
0.9750	0.843138	0.720592	0.643474	0.589697	0.549674	0.518514
0.9900	0.761240	0.660057	0.595085	0.549138	0.514584	0.487459
0.9950	0.712596	0.623436	0.565443	0.524064	0.492735	0.468009
0.9990	0.627065	0.557715	0.511498	0.477952	0.452223	0.431708
0.9995	0.598281	0.535187	0.492771	0.461791	0.437918	0.418812
0.9999	0.543669	0.491828	0.456363	0.430136	0.409731	0.393277

COEFFICIENTS OF w_7 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	1.768395	1.553007	1.391401	1.265955	1.165891	0.868016
0.0005	1.555790	1.380563	1.247480	1.143116	1.059142	0.804752
0.0010	1.468582	1.309165	1.187426	1.091519	1.014046	0.777490
0.0050	1.274111	1.148391	1.051090	0.973566	0.910336	0.713453
0.0100	1.192913	1.080563	0.993070	0.922998	0.865590	0.685198
0.0250	1.086673	0.991126	0.916068	0.855510	0.805583	0.646656
0.0500	1.006050	0.922688	0.856732	0.803194	0.758826	0.616067
0.1000	0.923654	0.852195	0.795210	0.748643	0.709830	0.583449
0.2000	0.836758	0.777195	0.729264	0.689796	0.656680	0.547357
0.3000	0.781566	0.729177	0.686758	0.651645	0.622049	0.523413
0.4000	0.738701	0.691665	0.653387	0.621564	0.594641	0.504206
0.5000	0.701829	0.659235	0.624413	0.595351	0.570681	0.487219
0.6000	0.667740	0.629112	0.597393	0.570822	0.548192	0.471102
0.7000	0.634049	0.599203	0.570460	0.546287	0.525630	0.454755
0.8000	0.597902	0.566952	0.541292	0.519618	0.501026	0.436718
0.9000	0.552924	0.526576	0.504585	0.485903	0.469798	0.413489
0.9500	0.519715	0.496580	0.477170	0.460606	0.446271	0.395726
0.9750	0.493432	0.472722	0.455272	0.440325	0.427348	0.381267
0.9900	0.465479	0.447228	0.431778	0.418489	0.406910	0.365469
0.9950	0.447888	0.431119	0.416880	0.404600	0.393874	0.355291
0.9990	0.414871	0.400742	0.388671	0.378206	0.369024	0.335659
0.9995	0.403084	0.389850	0.378518	0.368676	0.360025	0.328472
0.9999	0.379646	0.368116	0.358199	0.349551	0.341923	0.313885

P \ n	60	70	80	90	100	
0.0001	0.720286	0.631533	0.571920	0.528858	0.496121	
0.0005	0.675679	0.597012	0.543637	0.504787	0.475076	
0.0010	0.656223	0.581829	0.531121	0.494084	0.465682	
0.0050	0.609921	0.545370	0.500864	0.468076	0.442762	
0.0100	0.589208	0.528904	0.487103	0.456182	0.432233	
0.0250	0.560653	0.506038	0.467887	0.439503	0.417417	
0.0500	0.537731	0.487535	0.452248	0.425865	0.405258	
0.1000	0.513019	0.467436	0.435161	0.410899	0.391865	
0.2000	0.485334	0.444720	0.415723	0.393785	0.376488	
0.3000	0.466756	0.429355	0.402495	0.382085	0.365934	
0.4000	0.451726	0.416850	0.391681	0.372485	0.357250	
0.5000	0.438335	0.405650	0.381959	0.363827	0.349399	
0.6000	0.425542	0.394898	0.372589	0.355459	0.341791	
0.7000	0.412476	0.383861	0.362936	0.346812	0.333912	
0.8000	0.397948	0.371524	0.352101	0.337075	0.325015	
0.9000	0.379062	0.355376	0.337847	0.324213	0.313224	
0.9500	0.364481	0.342823	0.326706	0.314119	0.303938	
0.9750	0.352517	0.332465	0.317475	0.305725	0.296194	
0.9900	0.339348	0.321001	0.307214	0.296365	0.287535	
0.9950	0.330806	0.313530	0.300503	0.290224	0.281840	
0.9990	0.314201	0.298922	0.287323	0.278122	0.270585	
0.9995	0.308079	0.293508	0.282418	0.273604	0.266372	
0.9999	0.295578	0.282405	0.272326	0.264282	0.257659	

COEFFICIENTS OF w_8 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001					68777.27	498.3850
0.0005					13752.88	221.6885
0.0010					6874.822	156.1209
0.0050					1372.380	68.60602
0.0100					684.5717	47.85945
0.0250					271.8799	29.43414
0.0500					134.3038	20.12781
0.1000					65.49211	13.51787
0.2000					31.03389	8.792672
0.3000					19.49364	6.655637
0.4000					13.67371	5.346588
0.5000					10.13123	4.420203
0.6000					7.713713	3.701486
0.7000					5.918850	3.101635
0.8000					4.477914	2.561604
0.9000					3.188640	2.014271
0.9500					2.494839	1.683793
0.9750					2.060910	1.459523
0.9900					1.686782	1.252240
0.9950					1.489142	1.136411
0.9990					1.181835	0.945693
0.9995					1.089089	0.885174
0.9999					0.926733	0.775349

P \ n	20	22	24	26	28	30
0.0001	84.65363	17.45739	8.015114	4.938835	3.522713	2.736167
0.0005	48.81819	12.32728	6.170813	3.992464	2.939364	2.334758
0.0010	38.40118	10.57419	5.494579	3.631182	2.710666	2.174357
0.0050	21.74556	7.315270	4.148539	2.882616	2.223907	1.826240
0.0100	16.89534	6.195577	3.650718	2.593617	2.030516	1.685029
0.0250	11.96807	4.922548	3.054576	2.236691	1.786629	1.504202
0.0500	9.104317	4.090146	2.642873	1.982002	1.608690	1.370101
0.1000	6.806700	3.348564	2.257418	1.736268	1.433432	1.235999
0.2000	4.942449	2.676018	1.888512	1.493193	1.256073	1.097972
0.3000	4.002815	2.302599	1.673722	1.347450	1.147540	1.012214
0.4000	3.383553	2.039388	1.517128	1.238925	1.065519	0.946683
0.5000	2.918880	1.830715	1.389446	1.148853	0.996588	0.891088
0.6000	2.539371	1.651695	1.277079	1.068287	0.934217	0.840346
0.7000	2.206950	1.487317	1.171310	0.991234	0.873887	0.790838
0.8000	1.892698	1.324170	1.063569	0.911408	0.810626	0.738448
0.9000	1.556092	1.139262	0.937642	0.816212	0.734080	0.674346
0.9500	1.341838	1.014908	0.850339	0.748874	0.679140	0.627819
0.9750	1.190663	0.923431	0.784589	0.697359	0.636626	0.591495
0.9900	1.046045	0.832560	0.717848	0.644299	0.592363	0.553361
0.9950	0.962897	0.778630	0.677503	0.611819	0.565018	0.529631
0.9990	0.821791	0.683899	0.605169	0.552764	0.514773	0.485670
0.9995	0.775796	0.652051	0.580398	0.532281	0.497179	0.470161
0.9999	0.690647	0.591680	0.532761	0.492491	0.462740	0.439619

COEFFICIENTS OF w_8 IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	32	34	36	38	40	50
0.0001	2.244870	1.912413	1.674029	1.495462	1.357062	0.966132
0.0005	1.947860	1.681131	1.487017	1.339829	1.224579	0.892521
0.0010	1.827445	1.586285	1.409606	1.274905	1.168946	0.860910
0.0050	1.562176	1.374846	1.235352	1.127562	1.041811	0.786934
0.0100	1.452848	1.286595	1.161864	1.064885	0.987330	0.754424
0.0250	1.311190	1.171166	1.064999	0.981729	0.914645	0.710215
0.0500	1.204808	1.083602	0.990904	0.917676	0.858323	0.675245
0.1000	1.097159	0.994151	0.914619	0.851293	0.799621	0.638075
0.2000	0.984891	0.899865	0.833499	0.780175	0.736329	0.597100
0.3000	0.914304	0.840012	0.781593	0.734362	0.695319	0.570008
0.4000	0.859893	0.793549	0.741061	0.698409	0.662999	0.548332
0.5000	0.813390	0.753598	0.706035	0.667207	0.634845	0.529206
0.6000	0.770654	0.716677	0.673514	0.638121	0.608511	0.511097
0.7000	0.728672	0.680206	0.641238	0.609140	0.582181	0.492770
0.8000	0.683920	0.641095	0.606452	0.577771	0.553575	0.472596
0.9000	0.628676	0.592461	0.562932	0.538319	0.517435	0.446690
0.9500	0.588218	0.556581	0.530624	0.508875	0.490337	0.426941
0.9750	0.556407	0.528202	0.504943	0.485370	0.468625	0.410905
0.9900	0.522785	0.498040	0.477520	0.460169	0.445263	0.393427
0.9950	0.501740	0.479071	0.460202	0.444197	0.430410	0.382191
0.9990	0.462493	0.443494	0.427568	0.413976	0.402206	0.360571
0.9995	0.448562	0.430802	0.415874	0.403107	0.392029	0.352676
0.9999	0.420993	0.405580	0.392556	0.381365	0.371616	0.336682

P \ n	60	70	80	90	100	
0.0001	0.783889	0.678095	0.608586	0.559147	0.521993	
0.0005	0.733718	0.640079	0.577887	0.533296	0.499576	
0.0010	0.711887	0.623388	0.564321	0.521815	0.489581	
0.0050	0.660067	0.583387	0.531578	0.493954	0.465218	
0.0100	0.636948	0.565358	0.516710	0.481230	0.454040	
0.0250	0.605146	0.540362	0.495978	0.463408	0.438327	
0.0500	0.579677	0.520173	0.479127	0.448852	0.425445	
0.1000	0.552281	0.498280	0.460744	0.432898	0.411271	
0.2000	0.521668	0.473586	0.439865	0.414680	0.395016	
0.3000	0.501176	0.456915	0.425679	0.402241	0.383873	
0.4000	0.484628	0.443366	0.414095	0.392046	0.374712	
0.5000	0.469909	0.431246	0.403691	0.382859	0.366436	
0.6000	0.455868	0.419625	0.393674	0.373987	0.358423	
0.7000	0.441550	0.407711	0.383365	0.364828	0.350130	
0.8000	0.425657	0.394411	0.371807	0.354523	0.340774	
0.9000	0.405041	0.377033	0.356623	0.340929	0.328388	
0.9500	0.389160	0.363546	0.344773	0.330273	0.318645	
0.9750	0.376153	0.352435	0.334966	0.321422	0.310528	
0.9900	0.361862	0.340155	0.324079	0.311562	0.301460	
0.9950	0.352607	0.332161	0.316964	0.305099	0.295501	
0.9990	0.334649	0.316557	0.303012	0.292377	0.283735	
0.9995	0.328040	0.310781	0.297825	0.287632	0.279334	
0.9999	0.314564	0.298951	0.287164	0.277849	0.270240	

Table A9

MOST EFFECTIVE (EFFICIENT) INTERVAL ESTIMATORS FOR σ, BASED ON ONE QUASI-RANGE OF A SAMPLE FROM A NORMAL POPULATION

[Upper and lower $(1-P)$ confidence bounds, B_{ur} and B_{lr}, of central $(1-2P)$ confidence interval, based on rth quasi-range, w_r, of sample of size n]

F_u = Effectiveness of Upper Confidence Bound

F_i = Effectiveness of Central Confidence Interval

E_u = Efficiency of Upper Confidence Bound

E_i = Efficiency of Central Confidence Interval

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
2	0	0.9999	5641.895	0.181748	0.9998	100.0	100.0
2	0	0.9995	1128.379	0.203147	0.9990	100.0	100.0
2	0	0.9990	564.1894	0.214892	0.9980	100.0	100.0
2	0	0.9950	112.8372	0.251905	0.9900	100.0	100.0
2	0	0.9900	56.41748	0.274516	0.9800	100.0	100.0
2	0	0.9750	22.56389	0.315475	0.9500	100.0	100.0
2	0	0.9500	11.27640	0.360775	0.9000	100.0	100.0
2	0	0.9000	5.627083	0.429890	0.8000	100.0	100.0
2	0	0.8000	2.791059	0.551758	0.6000	100.0	100.0
2	0	0.7000	1.835113	0.682250	0.4000	100.0	100.0
2	0	0.6000	1.348410	0.840172	0.2000	100.0	100.0
2	0	0.5000	1.048358			100.0	
3	0	0.9999	52.50243	0.170527	0.9998	99.7	99.7
3	0	0.9995	23.47744	0.188097	0.9990	99.7	99.7
3	0	0.9990	16.59896	0.197494	0.9980	99.7	99.7
3	0	0.9950	7.415786	0.226028	0.9900	99.7	99.7
3	0	0.9900	5.237111	0.242701	0.9800	99.7	99.7
3	0	0.9750	3.299561	0.271572	0.9500	99.7	99.7
3	0	0.9500	2.318021	0.301705	0.9000	99.7	99.7
3	0	0.9000	1.617201	0.344545	0.8000	99.7	99.6
3	0	0.8000	1.110998	0.412621	0.6000	99.8	99.6
3	0	0.7000	0.878535	0.477420	0.4000	99.8	99.6
3	0	0.6000	0.733893	0.547549	0.2000	99.8	99.6
3	0	0.5000	0.629807			99.9	
4	0	0.9999	10.82318	0.164396	0.9998	99.2	99.1
4	0	0.9995	6.322927	0.180088	0.9990	99.2	99.1
4	0	0.9990	5.013886	0.188366	0.9980	99.2	99.1
4	0	0.9950	2.917986	0.213034	0.9900	99.2	99.0
4	0	0.9900	2.305867	0.227128	0.9800	99.2	99.0
4	0	0.9750	1.681682	0.251003	0.9500	99.2	98.9
4	0	0.9500	1.316598	0.275242	0.9000	99.3	98.9
4	0	0.9000	1.021069	0.308599	0.8000	99.3	98.8
4	0	0.8000	0.777803	0.359227	0.6000	99.4	98.8
4	0	0.7000	0.652961	0.405055	0.4000	99.5	98.7
4	0	0.6000	0.569305	0.452431	0.2000	99.6	98.7
4	0	0.5000	0.505479			99.7	
5	0	0.9999	4.866452	0.160264	0.9998	98.5	98.3
5	0	0.9995	3.244414	0.174771	0.9990	98.5	98.3
5	0	0.9990	2.721889	0.182357	0.9980	98.5	98.2
5	0	0.9950	1.802113	0.204684	0.9900	98.6	98.1
5	0	0.9900	1.503725	0.217258	0.9800	98.6	98.0
5	0	0.9750	1.176925	0.238264	0.9500	98.7	97.9
5	0	0.9500	0.970930	0.259225	0.9000	98.7	97.8
5	0	0.9000	0.792771	0.287498	0.8000	98.9	97.8
5	0	0.8000	0.635550	0.329238	0.6000	99.0	97.7
5	0	0.7000	0.549920	0.365913	0.4000	99.2	97.6
5	0	0.6000	0.490173	0.402832	0.2000	99.4	97.6
5	0	0.5000	0.443089			99.6	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
6	0	0.9999	2.992513	0.157190	0.9998	97.9	97.5
6	0	0.9995	2.156566	0.170857	0.9990	97.9	97.3
6	0	0.9990	1.870081	0.177957	0.9980	97.9	97.3
6	0	0.9950	1.335144	0.198670	0.9900	98.0	97.1
6	0	0.9900	1.150066	0.210214	0.9800	98.0	97.0
6	0	0.9750	0.938129	0.229310	0.9500	98.2	96.8
6	0	0.9500	0.798157	0.248133	0.9000	98.3	96.7
6	0	0.9000	0.671955	0.273170	0.8000	98.5	96.6
6	0	0.8000	0.555557	0.309431	0.6000	98.7	96.5
6	0	0.7000	0.489709	0.340651	0.4000	99.0	96.5
6	0	0.6000	0.442548	0.371518	0.2000	99.2	96.4
6	0	0.5000	0.404588			99.5	
7	0	0.9999	2.152779	0.154765	0.9998	97.2	96.5
7	0	0.9995	1.632416	0.167793	0.9990	97.3	96.3
7	0	0.9990	1.446451	0.174528	0.9980	97.3	96.3
7	0	0.9950	1.084804	0.194039	0.9900	97.4	96.0
7	0	0.9900	0.954067	0.204827	0.9800	97.5	95.9
7	0	0.9750	0.799680	0.222538	0.9500	97.7	95.7
7	0	0.9500	0.694376	0.239834	0.9000	97.9	95.6
7	0	0.9000	0.596641	0.262598	0.8000	98.1	95.5
7	0	0.8000	0.503665	0.295100	0.6000	98.5	.4
7	0	0.7000	0.449642	0.322664	0.4000	98.8	95.3
7	0	0.6000	0.410222	0.349561	0.2000	99.1	95.3
7	0	0.5000	0.378007			99.4	
8	0	0.9999	1.694382	0.152776	0.9998	96.6	95.6
8	0	0.9995	1.331535	0.165296	0.9990	96.7	95.4
8	0	0.9990	1.197855	0.171741	0.9980	96.8	95.2
8	0	0.9950	0.929989	0.190311	0.9900	96.9	95.0
8	0	0.9900	0.830000	0.200514	0.9800	97.1	94.8
8	0	0.9750	0.709210	0.217162	0.9500	97.3	94.7
8	0	0.9500	0.624839	0.233301	0.9000	97.5	94.5
8	0	0.9000	0.544826	0.254366	0.8000	97.8	94.4
8	0	0.8000	0.466928	0.284104	0.6000	98.2	94.2
8	0	0.7000	0.420747	0.309030	0.4000	98.6	94.2
8	0	0.6000	0.386570	0.333105	0.2000	99.0	94.1
8	0	0.5000	0.358315			99.3	
9	0	0.9999	1.411017	0.151098	0.9998	96.1	94.6
9	0	0.9995	1.138489	0.163200	0.9990	96.2	94.4
9	0	0.9990	1.035725	0.169408	0.9980	96.3	94.2
9	0	0.9950	0.825004	0.187215	0.9900	96.5	93.9
9	0	0.9900	0.744388	0.196947	0.9800	96.6	93.8
9	0	0.9750	0.645278	0.212747	0.9500	96.9	93.6
9	0	0.9500	0.574762	0.227972	0.9000	97.2	93.4
9	0	0.9000	0.506758	0.247707	0.8000	97.5	93.3
9	0	0.8000	0.439344	0.275316	0.6000	98.0	93.1
9	0	0.7000	0.398740	0.298236	0.4000	98.5	93.1
9	0	0.6000	0.368355	0.320192	0.2000	98.9	93.0
9	0	0.5000	0.343002			99.3	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
10	0	0.9999	1.220356	0.149652	0.9998	95.6	93.7
10	0	0.9995	1.004804	0.161401	0.9990	95.7	93.4
10	0	0.9990	0.922013	0.167411	0.9980	95.8	93.3
10	0	0.9950	0.749104	0.184583	0.9900	96.1	92.9
10	0	0.9900	0.681648	0.193925	0.9800	96.3	92.8
10	0	0.9750	0.597544	0.209029	0.9500	96.6	92.6
10	0	0.9500	0.536814	0.223507	0.9000	96.9	92.4
10	0	0.9000	0.477453	0.242169	0.8000	97.3	92.2
10	0	0.8000	0.417738	0.268076	0.6000	97.9	92.1
10	0	0.7000	0.381307	0.289414	0.4000	98.3	92.0
10	0	0.6000	0.353796	0.309715	0.2000	98.8	92.0
10	0	0.5000	0.330666			99.3	
11	0	0.9999	1.083995	0.148385	0.9998	95.1	92.8
11	0	0.9995	0.906960	0.159832	0.9990	95.3	92.5
11	0	0.9990	0.837939	0.165673	0.9980	95.4	92.3
11	0	0.9950	0.691601	0.182303	0.9900	95.7	92.0
11	0	0.9900	0.633592	0.191316	0.9800	95.9	91.8
11	0	0.9750	0.560427	0.205834	0.9500	96.3	91.6
11	0	0.9500	0.506950	0.219690	0.9000	96.6	91.4
11	0	0.9000	0.454092	0.237462	0.8000	97.1	91.2
11	0	0.8000	0.400270	0.261973	0.6000	97.7	91.1
11	0	0.7000	0.367081	0.282025	0.4000	98.2	91.0
11	0	0.6000	0.341826	0.300992	0.2000	98.7	90.9
11	0	0.5000	0.320458			99.2	
12	0	0.9999	0.981891	0.147261	0.9998	94.7	91.9
12	0	0.9995	0.832298	0.158444	0.9990	94.9	91.6
12	0	0.9990	0.773245	0.164137	0.9980	95.0	91.4
12	0	0.9950	0.646455	0.180300	0.9900	95.4	91.0
12	0	0.9900	0.595520	0.189029	0.9800	95.6	90.9
12	0	0.9750	0.530652	0.203046	0.9500	96.0	90.6
12	0	0.9500	0.482752	0.216373	0.9000	96.4	90.4
12	0	0.9000	0.434961	0.233392	0.8000	96.9	90.2
12	0	0.8000	0.385793	0.256733	0.6000	97.6	90.1
12	0	0.7000	0.355198	0.275716	0.4000	98.1	90.0
12	0	0.6000	0.331766	0.293583	0.2000	98.7	90.0
12	1	0.5000	0.454946			99.3	
13	0	0.9999	0.902675	0.146253	0.9998	94.3	91.0
13	0	0.9995	0.773444	0.157202	0.9990	94.5	90.7
13	0	0.9990	0.721890	0.162766	0.9980	94.7	90.5
13	0	0.9950	0.610006	0.178518	0.9900	95.1	90.1
13	0	0.9900	0.564547	0.187000	0.9800	95.3	89.9
13	0	0.9750	0.506172	0.200582	0.9500	95.7	89.7
13	0	0.9500	0.462689	0.213451	0.9000	96.2	89.5
13	0	0.9000	0.418953	0.229824	0.8000	96.7	89.3
13	0	0.8000	0.373557	0.252167	0.6000	97.4	89.1
13	0	0.7000	0.345087	0.270245	0.4000	98.1	89.1
13	0	0.6000	0.323159	0.287186	0.2000	98.6	89.0
13	1	0.5000	0.435498			99.4	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
14	0	0.9999	0.839449	0.145340	0.9998	93.9	90.2
14	0	0.9995	0.725832	0.156081	0.9990	94.2	89.9
14	0	0.9990	0.680094	0.161529	0.9980	94.4	89.7
14	0	0.9950	0.579911	0.176918	0.9900	94.8	89.3
14	0	0.9900	0.538805	0.185182	0.9800	95.1	89.1
14	0	0.9750	0.485642	0.198381	0.9500	95.5	88.8
14	0	0.9500	0.445740	0.210849	0.9000	96.0	88.6
14	0	0.9000	0.405323	0.226659	0.8000	96.5	88.4
14	0	0.8000	0.363047	0.248139	0.6000	97.3	88.3
14	0	0.7000	0.336352	0.265439	0.4000	98.0	88.2
14	0	0.6000	0.315689	0.281589	0.2000	98.6	88.1
14	1	0.5000	0.419280			99.4	
15	0	0.9999	0.787813	0.144507	0.9998	93.6	89.4
15	0	0.9995	0.686491	0.155061	0.9990	93.9	89.0
15	0	0.9990	0.645380	0.160405	0.9980	94.1	88.9
15	0	0.9950	0.554599	0.175469	0.9900	94.6	88.4
15	0	0.9900	0.517032	0.183538	0.9800	94.8	88.2
15	0	0.9750	0.468140	0.196396	0.9500	95.3	88.0
15	0	0.9500	0.431199	0.208510	0.9000	95.8	87.8
15	0	0.9000	0.393548	0.223825	0.8000	96.4	87.6
15	0	0.8000	0.353897	0.244548	0.6000	97.2	87.4
15	0	0.7000	0.328708	0.261172	0.4000	97.9	87.3
15	1	0.6000	0.429854	0.383208	0.2000	98.6	84.6*
15	1	0.5000	0.405506			99.4	
16	0	0.9999	0.744835	0.143742	0.9998	93.3	88.6
16	0	0.9995	0.653410	0.154126	0.9990	93.6	88.3
16	0	0.9990	0.616056	0.159376	0.9980	93.8	88.1
16	0	0.9950	0.532982	0.174147	0.9900	94.3	87.6
16	0	0.9900	0.498344	0.182040	0.9800	94.6	87.4
16	0	0.9750	0.453013	0.194594	0.9500	95.1	87.2
16	0	0.9500	0.418560	0.206392	0.9000	95.6	87.0
16	0	0.9000	0.383252	0.221265	0.8000	96.3	86.8
16	0	0.8000	0.345842	0.241320	0.6000	97.1	86.6
16	0	0.7000	0.321947	0.257348	0.4000	97.8	86.5
16	1	0.6000	0.416321	0.372769	0.2000	98.6	84.8*
16	1	0.5000	0.393631			99.5	
17	0	0.9999	0.708486	0.143036	0.9998	93.0	87.9
17	0	0.9995	0.625178	0.153265	0.9990	93.4	87.5
17	0	0.9990	0.590931	0.158429	0.9980	93.6	87.3
17	0	0.9950	0.514278	0.172933	0.9900	94.1	86.9
17	0	0.9900	0.482104	0.180668	0.9800	94.4	86.7
17	0	0.9750	0.439786	0.192947	0.9500	95.0	86.4
17	0	0.9500	0.407453	0.204459	0.9000	95.5	86.2
17	0	0.9000	0.374155	0.218937	0.8000	96.1	86.0
17	0	0.8000	0.338681	0.238395	0.6000	97.0	85.8
17	1	0.7000	0.429367	0.344245	0.4000	97.9	85.0*
17	1	0.6000	0.404551	0.363621	0.2000	98.7	85.0*
17	1	0.5000	0.383262			99.5	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
18	0	0.9999	0.677326	0.142381	0.9998	92.8	87.2
18	0	0.9995	0.600780	0.152467	0.9990	93.1	86.8
18	0	0.9990	0.569140	0.157553	0.9980	93.3	86.6
18	0	0.9950	0.497916	0.171812	0.9900	93.9	86.1
18	0	0.9900	0.467839	0.179403	0.9800	94.3	85.9
18	0	0.9750	0.428103	0.191431	0.9500	94.8	85.6
18	0	0.9500	0.397599	0.202686	0.9000	95.3	85.4
18	0	0.9000	0.366045	0.216807	0.8000	96.0	85.2
18	1	0.8000	0.447574	0.317353	0.6000	97.0	85.0*
18	1	0.7000	0.417535	0.337127	0.4000	97.9	85.1
18	1	0.6000	0.394199	0.355523	0.2000	98.7	85.1
18	1	0.5000	0.374113			99.5	
19	0	0.9999	0.650298	0.141770	0.9998	92.5	86.5
19	0	0.9995	0.579466	0.151725	0.9990	92.9	86.1
19	0	0.9990	0.550041	0.156738	0.9980	93.1	85.9
19	0	0.9950	0.483462	0.170773	0.9900	93.7	85.4
19	0	0.9900	0.455194	0.178231	0.9800	94.1	85.2
19	0	0.9750	0.417696	0.190031	0.9500	94.7	84.9
19	0	0.9500	0.388785	0.201050	0.9000	95.2	84.7
19	0	0.9000	0.358758	0.214846	0.8000	95.9	84.5
19	1	0.8000	0.435357	0.311842	0.6000	97.1	85.0
19	1	0.7000	0.407066	0.330750	0.4000	98.0	85.1
19	1	0.6000	0.385008	0.348289	0.2000	98.8	85.1
19	1	0.5000	0.365964			99.5	
20	0	0.9999	0.626618	0.141199	0.9998	92.3	85.8
20	0	0.9995	0.560669	0.151031	0.9990	92.7	85.4
20	0	0.9990	0.533149	0.155977	0.9980	92.9	85.2
20	0	0.9950	0.470588	0.169805	0.9900	93.6	84.7
20	0	0.9900	0.443894	0.177141	0.9800	93.9	84.5
20	0	0.9750	0.408353	0.188730	0.9500	94.5	84.2*
20	0	0.9500	0.380843	0.199534	0.9000	95.1	84.0*
20	1	0.9000	0.466276	0.284064	0.8000	96.0	84.9
20	1	0.8000	0.424495	0.306854	0.6000	97.2	85.0
20	1	0.7000	0.397722	0.324995	0.4000	98.1	85.1
20	1	0.6000	0.376780	0.341778	0.2000	98.8	85.1
20	2	0.5000	0.446295			99.5	
22	0	0.9999	0.587038	0.140157	0.9998	91.9	84.5
22	0	0.9995	0.528984	0.149768	0.9990	92.3	84.1
22	0	0.9990	0.504567	0.154594	0.9980	92.5	83.9*
22	0	0.9950	0.448602	0.168051	0.9900	93.2	83.4*
22	0	0.9900	0.424514	0.175169	0.9800	93.6	83.2*
22	1	0.9750	0.512309	0.248119	0.9500	94.5	84.6
22	1	0.9500	0.478558	0.260909	0.9000	95.3	84.7
22	1	0.9000	0.443551	0.276868	0.8000	96.2	84.8
22	1	0.8000	0.405978	0.298148	0.6000	97.3	84.9
22	1	0.7000	0.381714	0.314992	0.4000	98.1	85.0
22	1	0.6000	0.362626	0.330500	0.2000	98.8	85.0
22	2	0.5000	0.424396			99.6	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
24	0	0.9999	0.555208	0.139227	0.9998	91.5	83.3*
24	0	0.9995	0.503248	0.148645	0.9990	92.0	82.9*
24	0	0.9990	0.481247	0.153365	0.9980	92.2	82.7*
24	1	0.9950	0.555501	0.221997	0.9900	93.3	84.3
24	1	0.9900	0.526178	0.230363	0.9800	93.9	84.4
24	1	0.9750	0.487042	0.243485	0.9500	94.8	84.5
24	1	0.9500	0.456685	0.255635	0.9000	95.5	84.6
24	1	0.9000	0.424990	0.270737	0.8000	96.3	84.7
24	1	0.8000	0.390725	0.290776	0.6000	97.4	84.7
24	1	0.7000	0.368451	0.306559	0.4000	98.2	84.7
24	1	0.6000	0.350844	0.321033	0.2000	98.9	84.8
24	2	0.5000	0.406658			99.6	
26	1	0.9999	0.678999	0.186699	0.9998	91.2	83.7
26	1	0.9995	0.615907	0.197901	0.9990	92.1	83.9
26	1	0.9990	0.589281	0.203469	0.9980	92.5	84.0
26	1	0.9950	0.528068	0.218828	0.9900	93.6	84.1
26	1	0.9900	0.501651	0.226868	0.9800	94.1	84.2
26	1	0.9750	0.466199	0.239443	0.9500	94.9	84.3
26	1	0.9500	0.438535	0.251050	0.9000	95.6	84.3
26	1	0.9000	0.409492	0.265429	0.8000	96.4	84.4
26	1	0.8000	0.377895	0.284426	0.6000	97.5	84.4
26	1	0.7000	0.357239	0.299325	0.4000	98.2	84.4
26	1	0.6000	0.340843	0.312940	0.2000	98.9	84.4
26	2	0.5000	0.391937			99.6	
28	1	0.9999	0.641154	0.184872	0.9998	91.5	83.7
28	1	0.9995	0.584662	0.195757	0.9990	92.3	83.8
28	1	0.9990	0.560684	0.201157	0.9980	92.7	83.8
28	1	0.9950	0.505227	0.216015	0.9900	93.8	83.9
28	1	0.9900	0.481142	0.223772	0.9800	94.3	83.9
28	1	0.9750	0.448663	0.235875	0.9500	95.0	84.0
28	1	0.9500	0.423189	0.247014	0.9000	95.7	84.0
28	1	0.9000	0.396315	0.260772	0.8000	96.5	84.0
28	1	0.8000	0.366918	0.278881	0.6000	97.5	84.1
28	1	0.7000	0.347606	0.293030	0.4000	98.2	84.1
28	2	0.6000	0.395864	0.364088	0.2000	98.9	83.0*
28	3	0.5000	0.442792			99.6	
30	1	0.9999	0.609687	0.183222	0.9998	91.7	83.5
30	1	0.9995	0.558490	0.193827	0.9990	92.5	83.5
30	1	0.9990	0.536651	0.199078	0.9980	92.9	83.6
30	1	0.9950	0.485874	0.213495	0.9900	93.9	83.6
30	1	0.9900	0.463699	0.221003	0.9800	94.4	83.6
30	1	0.9750	0.433669	0.232692	0.9500	95.1	83.6
30	1	0.9500	0.410011	0.243423	0.9000	95.8	83.7
30	1	0.9000	0.384945	0.256642	0.8000	96.5	83.7
30	1	0.8000	0.357394	0.273981	0.6000	97.5	83.7
30	2	0.7000	0.401490	0.339840	0.4000	98.3	83.1*
30	2	0.6000	0.384063	0.354357	0.2000	99.0	83.1*
30	3	0.5000	0.426966			99.7	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
32	1	0.9999	0.583077	0.181722	0.9998	91.9	83.2
32	1	0.9995	0.536213	0.192074	0.9990	92.7	83.3
32	1	0.9990	0.516136	0.197193	0.9980	93.0	83.3
32	1	0.9950	0.469235	0.211217	0.9900	94.0	83.3
32	1	0.9900	0.448652	0.218504	0.9800	94.4	83.3
32	1	0.9750	0.420675	0.229827	0.9500	95.2	83.3
32	1	0.9500	0.398545	0.240199	0.9000	95.8	83.3
32	1	0.9000	0.375011	0.252943	0.8000	96.6	83.3
32	2	0.8000	0.410628	0.317077	0.6000	97.5	83.2*
32	2	0.7000	0.390145	0.332142	0.4000	98.3	83.2*
32	2	0.6000	0.373811	0.345856	0.2000	99.0	83.2*
32	3	0.5000	0.413414			99.7	
34	1	0.9999	0.560249	0.180348	0.9998	92.0	83.0
34	1	0.9995	0.516994	0.190474	0.9990	92.7	82.9
34	1	0.9990	0.498390	0.195473	0.9980	93.1	82.9
34	1	0.9950	0.454751	0.209144	0.9900	94.0	82.9
34	1	0.9900	0.435516	0.216233	0.9800	94.5	82.9
34	1	0.9750	0.409284	0.227229	0.9500	95.2	82.9*
34	1	0.9500	0.388460	0.237281	0.9000	95.8	82.9*
34	2	0.9000	0.428612	0.292556	0.8000	96.6	83.1
34	2	0.8000	0.399459	0.310984	0.6000	97.6	83.2
34	2	0.7000	0.380202	0.325325	0.4000	98.4	83.3
34	2	0.6000	0.364801	0.338348	0.2000	99.0	83.3
34	3	0.5000	0.401650			99.7	
36	1	0.9999	0.540427	0.179082	0.9998	92.1	82.6
36	1	0.9995	0.500220	0.189002	0.9990	92.8	82.6
36	1	0.9990	0.482867	0.193893	0.9980	93.2	82.6
36	1	0.9950	0.442010	0.207246	0.9900	94.1	82.5*
36	1	0.9900	0.423929	0.214156	0.9800	94.5	82.5*
36	1	0.9750	0.399198	0.224858	0.9500	95.2	82.5*
36	2	0.9500	0.441912	0.274350	0.9000	95.9	83.0
36	2	0.9000	0.417060	0.287864	0.8000	96.7	83.1
36	2	0.8000	0.389600	0.305527	0.6000	97.7	83.2
36	2	0.7000	0.371398	0.319235	0.4000	98.4	83.2
36	2	0.6000	0.356804	0.331654	0.2000	99.1	83.2
36	4	0.5000	0.440905			99.7	
38	1	0.9999	0.523035	0.177911	0.9998	92.2	82.3
38	1	0.9995	0.485435	0.187643	0.9990	92.9	82.2*
38	1	0.9990	0.469155	0.192435	0.9980	93.2	82.2*
38	1	0.9950	0.430698	0.205497	0.9900	94.1	82.1*
38	1	0.9900	0.413618	0.212246	0.9800	94.5	82.1*
38	2	0.9750	0.452205	0.259954	0.9500	95.3	82.9
38	2	0.9500	0.430254	0.270588	0.9000	96.0	83.0
38	2	0.9000	0.406812	0.283617	0.8000	96.8	83.1
38	2	0.8000	0.380819	0.300602	0.6000	97.8	83.1
38	2	0.7000	0.363536	0.313751	0.4000	98.5	83.1
38	2	0.6000	0.349646	0.325640	0.2000	99.1	83.2
38	4	0.5000	0.428509			99.7	

A. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	n	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
40	1	0.9999	0.507635	0.176822	0.9998	92.2	81.9*
40	1	0.9995	0.472289	0.186381	0.9990	92.9	81.8*
40	1	0.9990	0.456942	0.191082	0.9980	93.2	81.8*
40	2	0.9950	0.485643	0.238249	0.9900	94.2	82.7
40	2	0.9900	0.466629	0.245555	0.9800	94.7	82.8
40	2	0.9750	0.440600	0.256855	0.9500	95.4	82.9
40	2	0.9500	0.419858	0.267153	0.9000	96.1	82.9
40	2	0.9000	0.397644	0.279748	0.8000	96.9	83.0
40	2	0.8000	0.372937	0.296128	0.6000	97.8	83.0
40	2	0.7000	0.356461	0.308779	0.4000	98.5	83.0
40	3	0.6000	0.387428	0.361199	0.2000	99.1	82.2*
40	4	0.5000	0.417544			99.7	
50	2	0.9999	0.510872	0.201169	0.9998	92.7	82.0
50	2	0.9995	0.479365	0.210739	0.9990	93.4	82.0
50	2	0.9990	0.465579	0.215418	0.9980	93.8	82.0
50	2	0.9950	0.432652	0.228073	0.9900	94.7	82.0*
50	2	0.9900	0.417859	0.234561	0.9800	95.1	82.1*
50	2	0.9750	0.397396	0.244531	0.9500	95.8	82.1*
50	2	0.9500	0.380902	0.253553	0.9000	96.4	82.1*
50	3	0.9000	0.403819	0.294576	0.8000	97.1	82.4
50	3	0.8000	0.381331	0.310060	0.6000	98.0	82.5
50	3	0.7000	0.366221	0.321947	0.4000	98.6	82.5
50	3	0.6000	0.353982	0.332624	0.2000	99.2	82.5
50	5	0.5000	0.411964			99.8	
60	2	0.9999	0.462261	0.195856	0.9998	93.1	81.0*
60	3	0.9995	0.480975	0.227795	0.9990	93.8	81.8
60	3	0.9990	0.468446	0.232395	0.9980	94.1	81.9
60	3	0.9950	0.438333	0.244790	0.9900	95.0	82.0
60	3	0.9900	0.424718	0.251119	0.9800	95.4	82.0
60	3	0.9750	0.405791	0.260816	0.9500	96.1	82.0
60	3	0.9500	0.390458	0.269562	0.9000	96.7	82.1
60	3	0.9000	0.373778	0.280142	0.8000	97.3	82.1
60	3	0.8000	0.354893	0.293719	0.6000	98.1	82.1
60	4	0.7000	0.372433	0.330996	0.4000	98.8	82.1*
60	4	0.6000	0.361037	0.341044	0.2000	99.3	82.1*
60	6	0.5000	0.408273			99.8	
70	3	0.9999	0.467559	0.212685	0.9998	93.5	81.3*
70	3	0.9995	0.443821	0.221456	0.9990	94.2	81.4*
70	3	0.9990	0.433306	0.225715	0.9980	94.5	81.4*
70	3	0.9950	0.407856	0.237144	0.9900	95.3	81.4*
70	4	0.9900	0.428459	0.263467	0.9800	95.7	81.8
70	4	0.9750	0.410822	0.272886	0.9500	96.3	81.9
70	4	0.9500	0.396473	0.281358	0.9000	96.9	81.9
70	4	0.9000	0.380802	0.291580	0.8000	97.5	82.0
70	4	0.8000	0.362980	0.304654	0.6000	98.3	82.0
70	4	0.7000	0.350855	0.314589	0.4000	98.8	82.0
70	5	0.6000	0.365998	0.347151	0.2000	99.3	81.8*
70	8	0.5000	0.431246			99.8	

A. VALUE OF **r**, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
80	4	0.9999	0.469950	0.225640	0.9998	93.8	81.4
80	4	0.9995	0.447735	0.234283	0.9990	94.5	81.4
80	4	0.9990	0.437860	0.238472	0.9980	94.8	81.5*
80	4	0.9950	0.413875	0.249687	0.9900	95.5	81.5*
80	4	0.9900	0.402909	0.255376	0.9800	95.9	81.5*
80	4	0.9750	0.387533	0.264044	0.9500	96.5	81.6*
80	4	0.9500	0.374961	0.271812	0.9000	97.0	81.6*
80	5	0.9000	0.385683	0.300395	0.8000	97.6	81.8
80	5	0.8000	0.368786	0.313003	0.6000	98.4	81.8
80	5	0.7000	0.357251	0.322559	0.4000	98.9	81.8
80	6	0.6000	0.369668	0.351798	0.2000	99.4	81.5*
80	8	0.5000	0.403691			99.9	
90	4	0.9999	0.442415	0.220885	0.9998	94.1	81.0*
90	4	0.9995	0.422924	0.229032	0.9990	94.7	81.0*
90	5	0.9990	0.440581	0.248688	0.9980	95.0	81.4
90	5	0.9950	0.417880	0.259685	0.9900	95.8	81.5
90	5	0.9900	0.407467	0.265252	0.9800	96.1	81.5
90	5	0.9750	0.392831	0.273722	0.9500	96.7	81.6
90	5	0.9500	0.380833	0.281300	0.9000	97.2	81.6
90	5	0.9000	0.367633	0.290393	0.8000	97.8	81.6
90	6	0.8000	0.373131	0.319621	0.6000	98.5	81.7*
90	6	0.7000	0.362116	0.328832	0.4000	99.0	81.7
90	6	0.6000	0.353070	0.337003	0.2000	99.4	81.7
90	8	0.5000	0.382859			99.9	
100	5	0.9999	0.445773	0.231240	0.9998	94.3	81.1*
100	5	0.9995	0.427203	0.239275	0.9990	94.9	81.2*
100	5	0.9990	0.418897	0.243154	0.9980	95.2	81.2*
100	5	0.9950	0.398580	0.253498	0.9900	95.9	81.2*
100	6	0.9900	0.410696	0.273356	0.9800	96.3	81.5
100	6	0.9750	0.396719	0.281635	0.9500	96.8	81.5
100	6	0.9500	0.385236	0.289030	0.9000	97.3	81.5
100	6	0.9000	0.372574	0.297891	0.8000	97.9	81.6
100	6	0.8000	0.358016	0.309127	0.6000	98.5	81.6
100	7	0.7000	0.365934	0.333912	0.4000	99.0	81.5*
100	7	0.6000	0.357250	0.341791	0.2000	99.5	81.5*
100	8	0.5000	0.366436			99.9	

B. VALUE OF **r**, CHOSEN TO MAXIMIZE EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, DOES NOT MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND--SEE TABLE A9A

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u(%)	F_i(%)
15	0	0.6000	0.309125	0.276636	0.2000	98.5	87.3
16	0	0.6000	0.303298	0.272212	0.2000	98.5	86.5
17	0	0.7000	0.315913	0.253894	0.4000	97.8	85.7
17	0	0.6000	0.298080	0.268227	0.2000	98.5	85.7
18	0	0.8000	0.332262	0.235728	0.6000	97.0	85.0
20	1	0.9750	0.543696	0.253514	0.9500	94.2	84.6
20	1	0.9500	0.505544	0.267071	0.9000	95.0	84.7
22	1	0.9990	0.666966	0.209010	0.9980	91.7	84.0
22	1	0.9950	0.589164	0.225609	0.9900	93.0	84.3
22	1	0.9900	0.556122	0.234357	0.9800	93.6	84.4
24	1	0.9999	0.725455	0.188742	0.9998	90.7	83.7
24	1	0.9995	0.653934	0.200304	0.9990	91.7	84.0
24	1	0.9990	0.623951	0.206065	0.9980	92.2	84.1
28	1	0.6000	0.332221	0.305919	0.2000	98.9	84.1
30	1	0.7000	0.339216	0.287485	0.4000	98.3	83.7
30	1	0.6000	0.324688	0.299752	0.2000	98.9	83.7
32	1	0.8000	0.349033	0.269610	0.6000	97.5	83.3
32	1	0.7000	0.331825	0.282551	0.4000	98.3	83.3
32	1	0.6000	0.318034	0.294278	0.2000	98.9	83.3
34	2	0.9750	0.480060	0.267069	0.9500	95.0	82.9
34	2	0.9500	0.455098	0.278496	0.9000	95.7	83.0
36	2	0.9950	0.516376	0.243555	0.9900	93.8	82.7
36	2	0.9900	0.494725	0.251310	0.9800	94.4	82.8
36	2	0.9750	0.465254	0.263342	0.9500	95.2	82.9
38	2	0.9995	0.565394	0.220925	0.9990	92.5	82.5
38	2	0.9990	0.545891	0.226254	0.9980	92.9	82.5
38	2	0.9950	0.500064	0.240788	0.9900	94.0	82.7
38	2	0.9900	0.479830	0.248307	0.9800	94.5	82.8
40	2	0.9999	0.588853	0.208333	0.9998	91.9	82.3
40	2	0.9995	0.546752	0.218904	0.9990	92.7	82.5
40	2	0.9990	0.528552	0.224101	0.9980	93.1	82.5
40	2	0.6000	0.343192	0.320197	0.2000	99.1	83.0
50	3	0.9950	0.482332	0.254851	0.9900	94.5	82.1
50	3	0.9900	0.465566	0.261900	0.9800	95.0	82.2
50	3	0.9750	0.442442	0.272754	0.9500	95.7	82.3
50	3	0.9500	0.423865	0.282598	0.9000	96.4	82.3
60	3	0.9999	0.509443	0.218354	0.9998	93.1	81.7
60	3	0.7000	0.342096	0.304071	0.4000	98.7	82.1
60	3	0.6000	0.331665	0.313316	0.2000	99.3	82.1

B. VALUE OF r, CHOSEN TO MAXIMIZE EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, DOES NOT MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND--SEE TABLE A9A

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	F_u (%)	F_i (%)
70	4	0.9999	0.506461	0.231428	0.9998	93.3	81.5
70	4	0.9995	0.480420	0.240697	0.9990	94.1	81.6
70	4	0.9990	0.468906	0.245202	0.9980	94.4	81.7
70	4	0.9950	0.441097	0.257305	0.9900	95.3	81.8
70	4	0.6000	0.340942	0.323440	0.2000	99.3	82.0
80	5	0.9990	0.468262	0.255338	0.9980	94.6	81.5
80	5	0.9950	0.442363	0.267148	0.9900	95.5	81.6
80	5	0.9900	0.430543	0.273147	0.9800	95.9	81.6
80	5	0.9750	0.413995	0.282297	0.9500	96.5	81.7
80	5	0.9500	0.400485	0.290510	0.9000	97.0	81.7
80	5	0.6000	0.347797	0.331052	0.2000	99.4	81.8
90	5	0.9999	0.470802	0.236071	0.9998	94.0	81.3
90	5	0.9995	0.449899	0.244574	0.9990	94.7	81.4
90	5	0.8000	0.352494	0.301946	0.6000	98.5	81.7
100	6	0.9999	0.470790	0.244728	0.9998	94.3	81.2
100	6	0.9995	0.451025	0.253088	0.9990	94.9	81.3
100	6	0.9990	0.442193	0.257127	0.9980	95.2	81.4
100	6	0.9950	0.420619	0.267907	0.9900	95.9	81.4
100	6	0.7000	0.348013	0.317597	0.4000	99.0	81.6
100	6	0.6000	0.339774	0.325090	0.2000	99.5	81.6

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u (%)	E_i (%)
2	0	0.9999	5641.895	0.181748	0.9998	100.0	100.0
2	0	0.9995	1128.379	0.203147	0.9990	100.0	100.0
2	0	0.9990	564.1894	0.214892	0.9980	100.0	100.0
2	0	0.9950	112.8372	0.251905	0.9900	100.0	100.0
2	0	0.9900	56.41748	0.274516	0.9800	100.0	100.0
2	0	0.9750	22.56389	0.315475	0.9500	100.0	100.0
2	0	0.9500	11.27640	0.360775	0.9000	100.0	100.0
2	0	0.9000	5.627083	0.429890	0.8000	100.0	100.0
2	0	0.8000	2.791059	0.551758	0.6000	100.0	100.0
2	0	0.7000	1.835113	0.682250	0.4000	100.0	100.0
2	0	0.6000	1.348410	0.840172	0.2000	100.0	100.0
2	0	0.5000	1.048358			100.0	
3	0	0.9999	52.50243	0.170527	0.9998	99.3	99.3
3	0	0.9995	23.47744	0.188097	0.9990	99.3	99.3
3	0	0.9990	16.59896	0.197494	0.9980	99.3	99.3
3	0	0.9950	7.415786	0.226028	0.9900	99.2	99.2
3	0	0.9900	5.237111	0.242701	0.9800	99.2	99.2
3	0	0.9750	3.299561	0.271572	0.9500	99.1	99.1
3	0	0.9500	2.318021	0.301705	0.9000	99.1	99.1
3	0	0.9000	1.617201	0.344545	0.8000	99.0	99.0
3	0	0.8000	1.110998	0.412621	0.6000	98.9	98.9
3	0	0.7000	0.878535	0.477420	0.4000	98.8	98.9
3	0	0.6000	0.733893	0.547549	0.2000	98.8	98.9
3	0	0.5000	0.629807			98.9	
4	0	0.9999	10.82318	0.164396	0.9998	97.9	97.9
4	0	0.9995	6.322927	0.180088	0.9990	97.8	97.8
4	0	0.9990	5.013886	0.188366	0.9980	97.8	97.8
4	0	0.9950	2.917986	0.213034	0.9900	97.6	97.6
4	0	0.9900	2.305867	0.227128	0.9800	97.5	97.5
4	0	0.9750	1.681682	0.251003	0.9500	97.3	97.4
4	0	0.9500	1.316598	0.275242	0.9000	97.1	97.2
4	0	0.9000	1.021069	0.308599	0.8000	96.9	97.0
4	0	0.8000	0.777803	0.359227	0.6000	96.6	96.9
4	0	0.7000	0.652961	0.405055	0.4000	96.4	96.8
4	0	0.6000	0.569305	0.452431	0.2000	96.5	96.8
4	0	0.5000	0.505479			96.8	
5	0	0.9999	4.866452	0.160264	0.9998	96.2	96.2
5	0	0.9995	3.244414	0.174771	0.9990	96.0	96.0
5	0	0.9990	2.721889	0.182357	0.9980	95.9	95.9
5	0	0.9950	1.802113	0.204684	0.9900	95.6	95.6
5	0	0.9900	1.503725	0.217258	0.9800	95.4	95.5
5	0	0.9750	1.176925	0.238264	0.9500	95.1	95.2
5	0	0.9500	0.970930	0.259225	0.9000	94.8	94.9
5	0	0.9000	0.792771	0.287498	0.8000	94.4	94.7
5	0	0.8000	0.635550	0.329238	0.6000	93.9	94.5
5	0	0.7000	0.549920	0.365913	0.4000	93.7	94.4
5	0	0.6000	0.490173	0.402832	0.2000	93.9	94.5
5	0	0.5000	0.443089			94.5	

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u(%)	E_i(%)
6	0	0.9999	2.992513	0.157190	0.9998	94.4	94.4
6	0	0.9995	2.156566	0.170857	0.9990	94.1	94.1
6	0	0.9990	1.870081	0.177957	0.9980	94.0	94.0
6	0	0.9950	1.335144	0.198670	0.9900	93.5	93.5
6	0	0.9900	1.150066	0.210214	0.9800	93.2	93.3
6	0	0.9750	0.938129	0.229310	0.9500	92.8	92.9
6	0	0.9500	0.798157	0.248133	0.9000	92.3	92.6
6	0	0.9000	0.671955	0.273170	0.8000	91.8	92.3
6	0	0.8000	0.555557	0.309431	0.6000	91.2	92.1
6	0	0.7000	0.489709	0.340651	0.4000	91.0	92.1
6	0	0.6000	0.442548	0.371518	0.2000	91.3	92.1
6	0	0.5000	0.404588			92.2	
7	0	0.9999	2.152779	0.154765	0.9998	92.5	92.5
7	0	0.9995	1.632416	0.167793	0.9990	92.2	92.1
7	0	0.9990	1.446451	0.174528	0.9980	92.0	92.0
7	0	0.9950	1.084804	0.194039	0.9900	91.3	91.4
7	0	0.9900	0.954067	0.204827	0.9800	91.0	91.1
7	0	0.9750	0.799680	0.222538	0.9500	90.4	90.7
7	0	0.9500	0.694376	0.239834	0.9000	89.9	90.3
7	0	0.9000	0.596641	0.262598	0.8000	89.2	90.0
7	0	0.8000	0.503665	0.295100	0.6000	88.5	89.7
7	0	0.7000	0.449642	0.322664	0.4000	88.4	89.7
7	0	0.6000	0.410222	0.349561	0.2000	88.8	89.8
7	0	0.5000	0.378007			89.9	
8	0	0.9999	1.694382	0.152776	0.9998	90.7	90.7
8	0	0.9995	1.331535	0.165296	0.9990	90.2	90.2
8	0	0.9990	1.197855	0.171741	0.9980	90.0	90.0
8	0	0.9950	0.929989	0.190311	0.9900	89.2	89.3
8	0	0.9900	0.830000	0.200514	0.9800	88.8	89.0
8	0	0.9750	0.709210	0.217162	0.9500	88.2	88.5
8	0	0.9500	0.624839	0.233301	0.9000	87.6	88.1
8	0	0.9000	0.544826	0.254366	0.8000	86.8	87.7
8	0	0.8000	0.466928	0.284104	0.6000	86.0	87.5
8	0	0.7000	0.420747	0.309030	0.4000	85.9	87.5
8	0	0.6000	0.386570	0.333105	0.2000	86.4	87.6
8	0	0.5000	0.358315			87.6	
9	0	0.9999	1.411017	0.151098	0.9998	88.9	88.8
9	0	0.9995	1.138489	0.163200	0.9990	88.3	88.3
9	0	0.9990	1.035725	0.169408	0.9980	88.0	88.0
9	0	0.9950	0.825004	0.187215	0.9900	87.2	87.3
9	0	0.9900	0.744388	0.196947	0.9800	86.7	86.9
9	0	0.9750	0.645278	0.212747	0.9500	86.0	86.4
9	0	0.9500	0.574762	0.227972	0.9000	85.3	86.0
9	0	0.9000	0.506758	0.247707	0.8000	84.5	85.6
9	0	0.8000	0.439344	0.275316	0.6000	83.7	85.4
9	0	0.7000	0.398740	0.298236	0.4000	83.6	85.4
9	0	0.6000	0.368355	0.320192	0.2000	84.2	85.5
9	0	0.5000	0.343002			85.5	

C. VALUE OF **r**, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u (%)	E_i (%)
10	0	0.9999	1.220356	0.149652	0.9998	87.1	87.1
10	0	0.9995	1.004804	0.161401	0.9990	86.5	86.5
10	0	0.9990	0.922013	0.167411	0.9980	86.2	86.2
10	0	0.9950	0.749104	0.184583	0.9900	85.3	85.4
10	0	0.9900	0.681648	0.193925	0.9800	84.8	85.0
10	0	0.9750	0.597544	0.209029	0.9500	84.0	84.4
10	0	0.9500	0.536814	0.223507	0.9000	83.2	84.0
10	0	0.9000	0.477453	0.242169	0.8000	82.4	83.6
10	0	0.8000	0.417738	0.268076	0.6000	81.5	83.4
10	0	0.7000	0.381307	0.289414	0.4000	81.4	83.4
10	0	0.6000	0.353796	0.309715	0.2000	82.1	83.5
10	0	0.5000	0.330666			83.5	
11	0	0.9999	1.083995	0.148385	0.9998	85.4	85.4
11	0	0.9995	0.906960	0.159832	0.9990	84.8	84.7
11	0	0.9990	0.837939	0.165673	0.9980	84.4	84.4
11	0	0.9950	0.691601	0.182303	0.9900	83.4	83.5
11	0	0.9900	0.633592	0.191316	0.9800	82.9	83.1
11	0	0.9750	0.560427	0.205834	0.9500	82.0	82.6
11	0	0.9500	0.506950	0.219690	0.9000	81.3	82.1
11	0	0.9000	0.454092	0.237462	0.8000	80.3	81.7
11	0	0.8000	0.400270	0.261973	0.6000	79.4	81.5
11	0	0.7000	0.367081	0.282025	0.4000	79.3	81.5
11	0	0.6000	0.341826	0.300992	0.2000	80.1	81.6
11	0	0.5000	0.320458			81.7	
12	0	0.9999	0.981891	0.147261	0.9998	83.8	83.8
12	0	0.9995	0.832298	0.158444	0.9990	83.1	83.1
12	0	0.9990	0.773245	0.164137	0.9980	82.7	82.7
12	0	0.9950	0.646455	0.180300	0.9900	81.7	81.8
12	0	0.9900	0.595520	0.189029	0.9800	81.1	81.4
12	0	0.9750	0.530652	0.203046	0.9500	80.2	80.8
12	0	0.9500	0.482752	0.216373	0.9000	79.4	80.3
12	0	0.9000	0.434961	0.233392	0.8000	78.4	79.9
12	0	0.8000	0.385793	0.256733	0.6000	77.5	79.7
12	0	0.7000	0.355198	0.275716	0.4000	77.4	79.7
12	0	0.6000	0.331766	0.293583	0.2000	78.2	79.8
12	0	0.5000	0.311832			79.9	
13	0	0.9999	0.902675	0.146253	0.9998	82.3	82.2
13	0	0.9995	0.773444	0.157202	0.9990	81.5	81.5
13	0	0.9990	0.721890	0.162766	0.9980	81.1	81.1
13	0	0.9950	0.610006	0.178518	0.9900	80.0	80.2
13	0	0.9900	0.564547	0.187000	0.9800	79.4	79.7
13	0	0.9750	0.506172	0.200582	0.9500	78.5	79.1
13	0	0.9500	0.462689	0.213451	0.9000	77.6	78.7
13	0	0.9000	0.418953	0.229824	0.8000	76.6	78.3
13	0	0.8000	0.373557	0.252167	0.6000	75.7	78.0
13	0	0.7000	0.345087	0.270245	0.4000	75.6	78.0
13	0	0.6000	0.323159	0.287186	0.2000	76.4	78.1
13	0	0.5000	0.304418			78.2	

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	B_{lr}/w_r	1-2P	E_u(%)	E_i(%)
14	0	0.9999	0.839449	0.145340	0.9998	80.8	80.7
14	0	0.9995	0.725832	0.156081	0.9990	80.0	79.9
14	0	0.9990	0.680094	0.161529	0.9980	79.6	79.6
14	0	0.9950	0.579911	0.176918	0.9900	78.4	78.6
14	0	0.9900	0.538805	0.185182	0.9800	77.8	78.2
14	0	0.9750	0.485642	0.198381	0.9500	76.8	77.6
14	0	0.9500	0.445740	0.210849	0.9000	76.0	77.1
14	0	0.9000	0.405323	0.226659	0.8000	75.0	76.7
14	0	0.8000	0.363047	0.248139	0.6000	74.0	76.4
14	0	0.7000	0.336352	0.265439	0.4000	73.9	76.5
14	0	0.6000	0.315689	0.281589	0.2000	74.8	76.5
14	0	0.5000	0.297955			76.6	
15	0	0.9999	0.787813	0.144507	0.9998	79.4	79.3
15	0	0.9995	0.686491	0.155061	0.9990	78.6	78.5
15	0	0.9990	0.645380	0.160405	0.9980	78.1	78.1
15	0	0.9950	0.554599	0.175469	0.9900	76.9	77.1
15	0	0.9900	0.517032	0.183538	0.9800	76.3	76.7
15	0	0.9750	0.468140	0.196396	0.9500	75.3	76.1
15	0	0.9500	0.431199	0.208510	0.9000	74.4	75.6
15	0	0.9000	0.393548	0.223825	0.8000	73.4	75.2
15	0	0.8000	0.353897	0.244548	0.6000	72.4	74.9
15	0	0.7000	0.328708	0.261172	0.4000	72.3	75.0
15	0	0.6000	0.309125	0.276636	0.2000	73.2	75.0
15	0	0.5000	0.292257			75.1	
16	0	0.9999	0.744835	0.143742	0.9998	78.1	77.9
16	0	0.9995	0.653410	0.154126	0.9990	77.2	77.1
16	0	0.9990	0.616056	0.159376	0.9980	76.7	76.7
16	0	0.9950	0.532982	0.174147	0.9900	75.5	75.7
16	0	0.9900	0.498344	0.182040	0.9800	74.9	75.3
16	0	0.9750	0.453013	0.194594	0.9500	73.8	74.6
16	0	0.9500	0.418560	0.206392	0.9000	72.9	74.2
16	0	0.9000	0.383252	0.221265	0.8000	71.9	73.8
16	0	0.8000	0.345842	0.241320	0.6000	70.9	73.5
16	0	0.7000	0.321947	0.257348	0.4000	70.8	73.5
16	0	0.6000	0.303298	0.272212	0.2000	71.8	73.6
16	0	0.5000	0.287181			73.6	
17	0	0.9999	0.708486	0.143036	0.9998	76.8	76.6
17	0	0.9995	0.625178	0.153265	0.9990	75.9	75.8
17	0	0.9990	0.590931	0.158429	0.9980	75.4	75.4
17	0	0.9950	0.514278	0.172933	0.9900	74.2	74.4
17	0	0.9900	0.482104	0.180668	0.9800	73.5	73.9
17	0	0.9750	0.439786	0.192947	0.9500	72.5	73.3
17	0	0.9500	0.407453	0.204459	0.9000	71.5	72.8
17	0	0.9000	0.374155	0.218937	0.8000	70.5	72.4
17	0	0.8000	0.338681	0.238395	0.6000	69.4	72.2
17	0	0.7000	0.315913	0.253894	0.4000	69.4	72.2
17	0	0.6000	0.298080	0.268227	0.2000	70.4	72.2
17	0	0.5000	0.282623			72.3	

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u (%)	E_i (%)
18	0	0.9999	0.677326	0.142381	0.9998	75.6	75.4
18	0	0.9995	0.600780	0.152467	0.9990	74.6	74.5
18	0	0.9990	0.569140	0.157553	0.9980	74.2	74.1
18	0	0.9950	0.497916	0.171812	0.9900	72.9	73.1
18	0	0.9900	0.467839	0.179403	0.9800	72.2	72.6
18	0	0.9750	0.428103	0.191431	0.9500	71.1	72.0
18	0	0.9500	0.397599	0.202686	0.9000	70.2	71.6
18	0	0.9000	0.366045	0.216807	0.8000	69.1	71.1
18	1	0.8000	0.447574	0.317353	0.6000	68.6	71.2
18	1	0.7000	0.417535	0.337127	0.4000	69.3	71.7
18	1	0.6000	0.394199	0.355523	0.2000	70.5	72.0
18	1	0.5000	0.374113			72.1	
19	0	0.9999	0.650298	0.141770	0.9998	74.4	74.2
19	0	0.9995	0.579466	0.151725	0.9990	73.4	73.3
19	0	0.9990	0.550041	0.156738	0.9980	73.0	72.9
19	0	0.9950	0.483462	0.170773	0.9900	71.6	71.9
19	0	0.9900	0.455194	0.178231	0.9800	71.0	71.4
19	0	0.9750	0.417696	0.190031	0.9500	69.9	70.8
19	0	0.9500	0.388785	0.201050	0.9000	68.9	70.3
19	1	0.9000	0.479705	0.288167	0.8000	68.4	70.8
19	1	0.8000	0.435357	0.311842	0.6000	68.7	71.4
19	1	0.7000	0.407066	0.330750	0.4000	69.4	71.8
19	1	0.6000	0.385008	0.348289	0.2000	70.5	72.0
19	1	0.5000	0.365964			72.1	
20	0	0.9999	0.626618	0.141199	0.9998	73.3	73.1
20	0	0.9995	0.560669	0.151031	0.9990	72.3	72.2
20	0	0.9990	0.533149	0.155977	0.9980	71.8	71.8
20	0	0.9950	0.470588	0.169805	0.9900	70.5	70.7
20	0	0.9900	0.443894	0.177141	0.9800	69.8	70.3
20	0	0.9750	0.408353	0.188730	0.9500	68.7	69.6*
20	1	0.9500	0.505544	0.267071	0.9000	68.3	70.4
20	1	0.9000	0.466276	0.284064	0.8000	68.5	70.9
20	1	0.8000	0.424495	0.306854	0.6000	68.8	71.4
20	1	0.7000	0.397722	0.324995	0.4000	69.4	71.7
20	1	0.6000	0.376780	0.341778	0.2000	70.5	72.0
20	1	0.5000	0.358649			72.1	
22	0	0.9999	0.587038	0.140157	0.9998	71.1	70.9
22	0	0.9995	0.528984	0.149768	0.9990	70.1	70.0
22	0	0.9990	0.504567	0.154594	0.9980	69.6	69.6
22	0	0.9950	0.448602	0.168051	0.9900	68.3	68.6*
22	1	0.9900	0.556122	0.234357	0.9800	68.4	69.9
22	1	0.9750	0.512309	0.248119	0.9500	68.5	70.2
22	1	0.9500	0.478558	0.260909	0.9000	68.5	70.5
22	1	0.9000	0.443551	0.276868	0.8000	68.5	70.8
22	1	0.8000	0.405978	0.298148	0.6000	68.7	71.2
22	1	0.7000	0.381714	0.314992	0.4000	69.1	71.5
22	1	0.6000	0.362626	0.330500	0.2000	70.2	71.7
22	1	0.5000	0.346020			71.8	

C. VALUE OF **r**, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u(%)	E_i(%)
24	0	0.9999	0.555208	0.139227	0.9998	69.2	68.9
24	0	0.9995	0.503248	0.148645	0.9990	68.2	68.0*
24	1	0.9990	0.623951	0.206065	0.9980	68.2	69.2
24	1	0.9950	0.555501	0.221997	0.9900	68.5	69.7
24	1	0.9900	0.526178	0.230363	0.9800	68.5	69.9
24	1	0.9750	0.487042	0.243485	0.9500	68.5	70.2
24	1	0.9500	0.456685	0.255635	0.9000	68.4	70.4
24	1	0.9000	0.424990	0.270737	0.8000	68.3	70.6
24	1	0.8000	0.390725	0.290776	0.6000	68.3	70.9
24	1	0.7000	0.368451	0.306559	0.4000	68.7	71.1
24	1	0.6000	0.350844	0.321033	0.2000	69.7	71.2
24	1	0.5000	0.335463			71.3	
26	1	0.9999	0.678999	0.186699	0.9998	68.1	68.8
26	1	0.9995	0.615907	0.197901	0.9990	68.3	69.2
26	1	0.9990	0.589281	0.203469	0.9980	68.4	69.3
26	1	0.9950	0.528068	0.218828	0.9900	68.5	69.6
26	1	0.9900	0.501651	0.226868	0.9800	68.4	69.7
26	1	0.9750	0.466199	0.239443	0.9500	68.3	69.9
26	1	0.9500	0.438535	0.251050	0.9000	68.2	70.0
26	1	0.9000	0.409492	0.265429	0.8000	67.9	70.2
26	1	0.8000	0.377895	0.284426	0.6000	67.8	70.4
26	1	0.7000	0.357239	0.299325	0.4000	68.2	70.5
26	1	0.6000	0.340843	0.312940	0.2000	69.2	70.7
26	1	0.5000	0.326470			70.7	
28	1	0.9999	0.641154	0.184872	0.9998	68.3	68.9
28	1	0.9995	0.584662	0.195757	0.9990	68.4	69.1
28	1	0.9990	0.560684	0.201157	0.9980	68.4	69.2
28	1	0.9950	0.505227	0.216015	0.9900	68.3	69.3
28	1	0.9900	0.481142	0.223772	0.9800	68.2	69.4
28	1	0.9750	0.448663	0.235875	0.9500	68.0	69.5
28	1	0.9500	0.423189	0.247014	0.9000	67.7	69.5
28	1	0.9000	0.396315	0.260772	0.8000	67.4	69.6
28	1	0.8000	0.366918	0.278881	0.6000	67.2	69.8
28	1	0.7000	0.347606	0.293030	0.4000	67.6	69.9
28	1	0.6000	0.332221	0.305919	0.2000	68.5	70.0
28	1	0.5000	0.318691			70.1	
30	1	0.9999	0.609687	0.183222	0.9998	68.2	68.7
30	1	0.9995	0.558490	0.193827	0.9990	68.2	68.8
30	1	0.9990	0.536651	0.199078	0.9980	68.2	68.9
30	1	0.9950	0.485874	0.213495	0.9900	68.0	68.9
30	1	0.9900	0.463699	0.221003	0.9800	67.8	68.9
30	1	0.9750	0.433669	0.232692	0.9500	67.5	69.0
30	1	0.9500	0.410011	0.243423	0.9000	67.2	69.0
30	1	0.9000	0.384945	0.256642	0.8000	66.9	69.0
30	1	0.8000	0.357394	0.273981	0.6000	66.6	69.1
30	1	0.7000	0.339216	0.287485	0.4000	66.9	69.2
30	1	0.6000	0.324688	0.299752	0.2000	67.8	69.3
30	1	0.5000	0.311877			69.4	

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u(%)	E_i(%)
32	1	0.9999	0.583077	0.181722	0.9998	68.1	68.5
32	1	0.9995	0.536213	0.192074	0.9990	68.0	68.5
32	1	0.9990	0.516136	0.197193	0.9980	67.9	68.5
32	1	0.9950	0.469235	0.211217	0.9900	67.6	68.4
32	1	0.9900	0.448652	0.218504	0.9800	67.4	68.4
32	1	0.9750	0.420675	0.229827	0.9500	67.0	68.4
32	1	0.9500	0.398545	0.240199	0.9000	66.7	68.4
32	1	0.9000	0.375011	0.252943	0.8000	66.2	68.4
32	2	0.8000	0.410628	0.317077	0.6000	66.1	68.5
32	2	0.7000	0.390145	0.332142	0.4000	66.6	68.8
32	2	0.6000	0.373811	0.345856	0.2000	67.6	68.9
32	2	0.5000	0.359436			69.0	
34	1	0.9999	0.560249	0.180348	0.9998	67.8	68.1
34	1	0.9995	0.516994	0.190474	0.9990	67.6	68.0
34	1	0.9990	0.498390	0.195473	0.9980	67.5	68.0
34	1	0.9950	0.454751	0.209144	0.9900	67.1	67.9
34	1	0.9900	0.435516	0.216233	0.9800	66.9	67.9
34	1	0.9750	0.409284	0.227229	0.9500	66.5	67.8
34	1	0.9500	0.388460	0.237281	0.9000	66.1	67.7*
34	2	0.9000	0.428612	0.292556	0.8000	66.0	68.3
34	2	0.8000	0.399459	0.310984	0.6000	66.2	68.6
34	2	0.7000	0.380202	0.325325	0.4000	66.7	68.8
34	2	0.6000	0.364801	0.338348	0.2000	67.6	69.0
34	2	0.5000	0.351213			69.0	
36	1	0.9999	0.540427	0.179082	0.9998	67.4	67.7
36	1	0.9995	0.500220	0.189002	0.9990	67.2	67.5
36	1	0.9990	0.482867	0.193893	0.9980	67.0	67.5
36	1	0.9950	0.442010	0.207246	0.9900	66.6	67.3*
36	1	0.9900	0.423929	0.214156	0.9800	66.3	67.2*
36	2	0.9750	0.465254	0.263342	0.9500	66.0	67.8
36	2	0.9500	0.441912	0.274350	0.9000	66.0	68.1
36	2	0.9000	0.417060	0.287864	0.8000	66.1	68.3
36	2	0.8000	0.389600	0.305527	0.6000	66.2	68.6
36	2	0.7000	0.371398	0.319235	0.4000	66.6	68.8
36	2	0.6000	0.356804	0.331654	0.2000	67.6	68.9
36	2	0.5000	0.343899			68.9	
38	1	0.9999	0.523035	0.177911	0.9998	67.0	67.2
38	1	0.9995	0.485435	0.187643	0.9990	66.7	67.0
38	1	0.9990	0.469155	0.192435	0.9980	66.5	66.9*
38	2	0.9950	0.500064	0.240788	0.9900	66.0	67.5
38	2	0.9900	0.479830	0.248307	0.9800	66.1	67.6
38	2	0.9750	0.452205	0.259954	0.9500	66.1	67.9
38	2	0.9500	0.430254	0.270588	0.9000	66.1	68.0
38	2	0.9000	0.406812	0.283617	0.8000	66.0	68.2
38	2	0.8000	0.380819	0.300602	0.6000	66.1	68.5
38	2	0.7000	0.363536	0.313751	0.4000	66.5	68.6
38	2	0.6000	0.349646	0.325640	0.2000	67.4	68.7
38	2	0.5000	0.337339			68.8	

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r} w_r$	1-2P	E_u (%)	E_i (%)
40	1	0.9999	0.507635	0.176822	0.9998	66.6	66.6*
40	1	0.9995	0.472289	0.186381	0.9990	66.2	66.4*
40	2	0.9990	0.528552	0.224101	0.9980	66.0	67.2
40	2	0.9950	0.485643	0.238249	0.9900	66.2	67.5
40	2	0.9900	0.466629	0.245555	0.9800	66.2	67.6
40	2	0.9750	0.440600	0.256855	0.9500	66.1	67.8
40	2	0.9500	0.419858	0.267153	0.9000	66.1	67.9
40	2	0.9000	0.397644	0.279748	0.8000	65.9	68.1
40	2	0.8000	0.372937	0.296128	0.6000	66.0	68.3
40	2	0.7000	0.356461	0.308779	0.4000	66.3	68.4
40	2	0.6000	0.343192	0.320197	0.2000	67.2	68.5
40	2	0.5000	0.331413			68.6	
50	2	0.9999	0.510872	0.201169	0.9998	66.0	66.5
50	2	0.9995	0.479365	0.210739	0.9990	66.0	66.6
50	2	0.9990	0.465579	0.215418	0.9980	65.9	66.6
50	2	0.9950	0.432652	0.228073	0.9900	65.7	66.7
50	2	0.9900	0.417859	0.234561	0.9800	65.6	66.7*
50	2	0.9750	0.397396	0.244531	0.9500	65.3	66.7*
50	3	0.9500	0.423865	0.282598	0.9000	65.2	67.1
50	3	0.9000	0.403819	0.294576	0.8000	65.2	67.3
50	3	0.8000	0.381331	0.310060	0.6000	65.3	67.5
50	3	0.7000	0.366221	0.321947	0.4000	65.8	67.7
50	3	0.6000	0.353982	0.332624	0.2000	66.6	67.8
50	3	0.5000	0.343066			67.8	
60	3	0.9999	0.509443	0.218354	0.9998	65.3	66.1
60	3	0.9995	0.480975	0.227795	0.9990	65.4	66.3
60	3	0.9990	0.468446	0.232395	0.9980	65.4	66.4
60	3	0.9950	0.438333	0.244790	0.9900	65.4	66.6
60	3	0.9900	0.424718	0.251119	0.9800	65.3	66.6
60	3	0.9750	0.405791	0.260816	0.9500	65.2	66.7
60	3	0.9500	0.390458	0.269562	0.9000	65.1	66.8
60	3	0.9000	0.373778	0.280142	0.8000	64.9	66.9
60	3	0.8000	0.354893	0.293719	0.6000	64.9	67.0
60	4	0.7000	0.372433	0.330996	0.4000	65.3	67.1*
60	4	0.6000	0.361037	0.341044	0.2000	66.1	67.2
60	4	0.5000	0.350835			67.2	
70	3	0.9999	0.467559	0.212685	0.9998	65.2	65.7*
70	3	0.9995	0.443821	0.221456	0.9990	65.2	65.8*
70	3	0.9990	0.433306	0.225715	0.9980	65.1	65.8*
70	4	0.9950	0.441097	0.257305	0.9900	65.0	66.3
70	4	0.9900	0.428459	0.263467	0.9800	65.0	66.4
70	4	0.9750	0.410822	0.272886	0.9500	65.0	66.5
70	4	0.9500	0.396473	0.281358	0.9000	64.9	66.6
70	4	0.9000	0.380802	0.291580	0.8000	64.8	66.7
70	4	0.8000	0.362980	0.304654	0.6000	64.9	66.9
70	4	0.7000	0.350855	0.314589	0.4000	65.2	67.0
70	4	0.6000	0.340942	0.323440	0.2000	66.0	67.0
70	4	0.5000	0.332029			67.1	

C. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/r$	1-2P	E_u (%)	E_i (%)
80	4	0.9999	0.469950	0.225640	0.9998	65.0	65.7
80	4	0.9995	0.447735	0.234283	0.9990	65.0	65.9
80	4	0.9990	0.437860	0.238472	0.9980	65.0	65.9
80	4	0.9950	0.413875	0.249687	0.9900	65.0	66.0*
80	4	0.9900	0.402909	0.255376	0.9800	64.9	66.1*
80	4	0.9750	0.387533	0.264044	0.9500	64.8	66.1*
80	5	0.9500	0.400485	0.290510	0.9000	64.7	66.4
80	5	0.9000	0.385683	0.300395	0.8000	64.7	66.5
80	5	0.8000	0.368786	0.313003	0.6000	64.8	66.7
80	5	0.7000	0.357251	0.322559	0.4000	65.1	66.8
80	5	0.6000	0.347797	0.331052	0.2000	65.8	66.8
80	5	0.5000	0.339278			66.9	
90	4	0.9999	0.442415	0.220885	0.9998	64.8	65.3*
90	5	0.9995	0.449899	0.244574	0.9990	64.8	65.8
90	5	0.9990	0.440581	0.248688	0.9980	64.8	65.9
90	5	0.9950	0.417880	0.259685	0.9900	64.8	66.0
90	5	0.9900	0.407467	0.265252	0.9800	64.8	66.1
90	5	0.9750	0.392831	0.273722	0.9500	64.7	66.2
90	5	0.9500	0.380833	0.281300	0.9000	64.7	66.2
90	5	0.9000	0.367633	0.290393	0.8000	64.6	66.3
90	6	0.8000	0.373131	0.319621	0.6000	64.6	66.4
90	6	0.7000	0.362116	0.328832	0.4000	65.0	66.5
90	6	0.6000	0.353070	0.337003	0.2000	65.7	66.6
90	6	0.5000	0.344903			66.6	
100	5	0.9999	0.445773	0.231240	0.9998	64.8	65.5*
100	5	0.9995	0.427203	0.239275	0.9990	64.8	65.5*
100	5	0.9990	0.418897	0.243154	0.9980	64.8	65.6*
100	6	0.9950	0.420619	0.267907	0.9900	64.7	65.9
100	6	0.9900	0.410696	0.273356	0.9800	64.7	66.0
100	6	0.9750	0.396719	0.281635	0.9500	64.7	66.1
100	6	0.9500	0.385236	0.289030	0.9000	64.6	66.2
100	6	0.9000	0.372574	0.297891	0.8000	64.6	66.3
100	6	0.8000	0.358016	0.309127	0.6000	64.6	66.4
100	6	0.7000	0.348013	0.317597	0.4000	64.9	66.4
100	6	0.6000	0.339774	0.325090	0.2000	65.6	66.5
100	6	0.5000	0.332319			66.5	

D. VALUE OF r, CHOSEN TO MAXIMIZE EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, DOES NOT MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND--SEE TABLE A9C

n	r	1-P	B_{ur}/w_r	$B_{\ell r}/w_r$	1-2P	E_u (%)	E_i (%)
20	1	0.9750	0.543696	0.253514	0.9500	68.2	70.0
22	1	0.9950	0.589164	0.225609	0.9900	68.2	69.6
24	1	0.9995	0.653934	0.200304	0.9990	68.1	69.0
34	2	0.9500	0.455098	0.278496	0.9000	65.9	68.0
36	2	0.9950	0.516376	0.243555	0.9900	65.8	67.3
36	2	0.9900	0.494725	0.251310	0.9800	65.9	67.6
38	2	0.9990	0.545891	0.226254	0.9980	65.8	67.1
40	2	0.9999	0.588853	0.208333	0.9998	65.7	66.7
40	2	0.9995	0.546752	0.218904	0.9990	66.0	67.0
50	3	0.9900	0.465566	0.261900	0.9800	65.1	66.7
50	3	0.9750	0.442442	0.272754	0.9500	65.2	67.0
60	3	0.7000	0.342096	0.304071	0.4000	65.2	67.1
70	4	0.9999	0.506461	0.231428	0.9998	64.7	65.8
70	4	0.9995	0.480420	0.240697	0.9990	64.9	66.0
70	4	0.9990	0.468906	0.245202	0.9980	64.9	66.1
80	5	0.9950	0.442363	0.267148	0.9900	64.6	66.0
80	5	0.9900	0.430543	0.273147	0.9800	64.7	66.1
80	5	0.9750	0.413995	0.282297	0.9500	64.7	66.3
90	5	0.9999	0.470802	0.236071	0.9998	64.8	65.6
100	6	0.9999	0.470790	0.244728	0.9998	64.5	65.5
100	6	0.9995	0.451025	0.253088	0.9990	64.6	65.7
100	6	0.9990	0.442193	0.257127	0.9980	64.6	65.7

Appendix B

TABLES BASED ON THE RANGE OF SAMPLES FROM A RECTANGULAR POPULATION

SOURCES OF TABLES

Table B1	WADC TR 58–200 (Harter)
Table B2–B4	ARL 31, Part I (Harter)

Table B1

EFFICIENT POINT ESTIMATORS FOR σ, BASED ON RANGE

ESTIMATES OF STANDARD DEVIATION OF RECTANGULAR POPULATION

Sample size, n	Estimate based on the range	Bias (%) of estimates which assume normality		
		One quasi-range	Two adjacent quasi-ranges	Any Two quasi-ranges*
2	.866025 w_o	2.33		
3	.577350 w_o	2.33		
4	.481125 w_o	0.96	1.98	1.98
5	.433013 w_o	-0.71	1.61	1.61
6	.404145 w_o	-2.37	1.13	1.13
7	.384900 w_o	-3.93	0.54	0.54
8	.371154 w_o	-5.37	-0.11	-0.11
9	.360844 w_o	-6.69	-0.80	-0.80
10	.352825 w_o	-7.90	-1.51	-1.51
11	.346410 w_o	-9.02	-2.22	-2.22
12	.341162 w_o	-10.04	-2.92	-1.47
13	.336788 w_o	-10.99	-3.60	-1.72
14	.333087 w_o	-11.87	-4.27	-2.01
15	.329914 w_o	-12.69	-4.92	-2.33
16	.327165 w_o	-13.46	-5.54	-2.66
17	.324760 w_o	-14.18	-6.14	-3.01
18	.322637 w_o	1.26	-6.72	-3.37
19	.320750 w_o	0.41	-7.28	-3.74
20	.319062 w_o	-0.39	-7.82	-4.11
21	.317543 w_o	-1.15	-8.33	-4.48
22	.316168 w_o	-1.87	-8.83	-3.11
23	.314918 w_o	-2.56	-9.31	-3.32
24	.313777 w_o	-3.22	-9.78	-3.53
25	.312731 w_o	-3.85	-10.23	-3.75
26	.311769 w_o	-4.45	-10.66	-3.98
27	.310881 w_o	-5.03	-11.08	-4.21
28	.310058 w_o	-5.58	-11.48	-4.45
29	.309295 w_o	-6.11	-11.87	-4.69
30	.308584 w_o	-6.63	-12.25	-4.94
31	.307920 w_o	-7.12	-12.61	-5.18
32	.307299 w_o	1.23	-12.97	-5.43
33	.306717 w_o	.0.71	-13.31	-3.95
34	.306171 w_o	0.20	-4.02	-4.11
35	.305656 w_o	-0.29	-4.43	-4.28

* Quasi-ranges 0 through 8 only

ESTIMATES OF STANDARD DEVIATION OF RECTANGULAR POPULATION

Sample size, n	Estimate based on the range	Bias (%) of estimates which assume normality		
		One quasi-range	Two adjacent quasi-ranges	Any Two quasi-ranges*
36	.305171 w_o	-0.77	-4.83	-4.45
37	.304713 w_o	-1.23	-5.22	-4.63
38	.304279 w_o	-1.68	-5.60	-4.81
39	.303869 w_o	-2.11	-5.96	-4.99
40	.303479 w_o	-2.53	-6.32	-5.17
41	.303109 w_o	-2.94	-6.67	-5.36
42	.302757 w_o	-3.34	-7.00	-5.54
43	.302422 w_o	-3.73	-7.33	-5.72
44	.302102 w_o	-4.10	-7.65	-5.91
45	.301797 w_o	-4.47	-7.97	-4.45
46	.301505 w_o	1.24	-8.27	-4.59
47	.301226 w_o	0.86	-8.57	-4.73
48	.300959 w_o	0.49	-2.46	-4.88
49	.300703 w_o	0.12	-2.79	-5.02
50	.300458 w_o	-0.23	-3.10	-5.17
51	.300222 w_o	-0.58	-3.41	-5.32
52	.299996 w_o	-0.92	-3.71	-5.46
53	.299778 w_o	-1.25	-4.01	-5.61
54	.299569 w_o	-1.57	-4.30	-5.76
55	.299367 w_o	-1.89	-4.58	-5.91
56	.299172 w_o	-2.20	-4.86	-0.63
57	.298985 w_o	-2.50	-5.13	-0.76
58	.298804 w_o	-2.79	-5.40	-0.89
59	.298629 w_o	-3.08	-5.66	-1.02
60	.298461 w_o	-3.37	-5.91	-1.15
61	.298298 w_o	0.95	-6.16	-1.28
62	.298140 w_o	0.66	-1.61	-1.41
63	.297987 w_o	0.37	-1.87	-1.55
64	.297839 w_o	0.09	-2.13	-1.67
65	.297696 w_o	-0.19	-2.39	-1.81
66	.297557 w_o	-0.46	-2.64	-1.94
67	.297423 w_o	-0.73	-2.88	-2.07
68	.297292 w_o	-0.99	-3.12	-2.20
69	.297166 w_o	-1.25	-3.36	-2.34
70	.297043 w_o	-1.50	-3.59	-2.47

* Quasi-ranges 0 through 8 only

ESTIMATES OF STANDARD DEVIATION OF RECTANGULAR POPULATION

Sample size, n	Estimate based on the range	Bias (%) of estimates which assume normality		
		One quasi-range	Two adjacent quasi-ranges	Any Two quasi-ranges*
71	.296923 w_o	-1.75	-3.82	-2.59
72	.296807 w_o	-1.99	-4.05	-2.73
73	.296694 w_o	-2.23	-4.27	-2.85
74	.296584 w_o	-2.47	-4.49	-2.98
75	.296477 w_o	1.01	-4.70	-3.11
76	.296373 w_o	0.77	-4.91	-3.24
77	.296272 w_o	0.53	-1.29	-3.36
78	.296173 w_o	0.30	-1.51	-3.49
79	.296077 w_o	0.07	-1.73	-3.62
80	.295983 w_o	-0.16	-1.94	-3.74
81	.295892 w_o	-0.38	-2.15	-3.87
82	.295803 w_o	-0.60	-2.36	-3.99
83	.295716 w_o	-0.82	-2.56	-4.11
84	.295631 w_o	-1.04	-2.76	-4.24
85	.295548 w_o	-1.25	-2.96	-4.36
86	.295467 w_o	-1.45	-3.15	-4.48
87	.295389 w_o	-1.66	-3.34	-4.60
88	.295311 w_o	-1.86	-3.53	-4.72
89	.295236 w_o	1.06	-3.72	-4.83
90	.295162 w_o	0.85	-3.91	-4.95
91	.295090 w_o	0.65	-0.89	-5.07
92	.295020 w_o	0.45	-1.08	-5.19
93	.294951 w_o	0.25	-1.27	-5.30
94	.294883 w_o	0.05	-1.45	-5.42
95	.294817 w_o	-0.14	-1.63	-5.53
96	.294753 w_o	-0.33	-1.81	-5.64
97	.294689 w_o	-0.52	-1.99	-5.76
98	.294627 w_o	-0.70	-2.17	-5.87
99	.294566 w_o	-0.88	-2.34	-5.98
100	.294507 w_o	-1.07	-2.51	-6.09

* Quasi-ranges 0 through 8 only

Table B2

PROBABILITY INTEGRAL OF THE RANGE, $P(W, n)$, FOR SAMPLES OF n FROM $R(\mu, 1)$

W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
0.01	0.0057 6517	0.0000 2495	0.0000 0010	0.0000 0000	
0.02	0.0115 1367	0.0000 9962	0.0000 0077	0.0000 0001	
0.03	0.0172 4551	0.0002 2370	0.0000 0258	0.0000 0003	
0.04	0.0229 6068	0.0003 9692	0.0000 0611	0.0000 0009	
0.05	0.0286 5918	0.0006 1899	0.0000 1190	0.0000 0021	0.0000 0000
0.06	0.0343 4102	0.0008 8961	0.0000 2051	0.0000 0044	0.0000 0001
0.07	0.0400 0619	0.0012 0850	0.0000 3250	0.0000 0082	0.0000 0002
0.08	0.0456 5469	0.0015 7537	0.0000 4841	0.0000 0140	0.0000 0004
0.09	0.0512 8652	0.0019 8993	0.0000 6878	0.0000 0223	0.0000 0007
0.10	0.0569 0169	0.0024 5189	0.0000 9414	0.0000 0339	0.0000 0012
0.11	0.0625 0020	0.0029 6096	0.0001 2503	0.0000 0495	0.0000 0019
0.12	0.0680 8203	0.0035 1686	0.0001 6196	0.0000 0700	0.0000 0029
0.13	0.0736 4720	0.0041 1930	0.0002 0546	0.0000 0962	0.0000 0043
0.14	0.0791 9570	0.0047 6798	0.0002 5604	0.0000 1291	0.0000 0063
0.15	0.0847 2754	0.0054 6262	0.0003 1421	0.0000 1697	0.0000 0088
0.16	0.0902 4271	0.0062 0293	0.0003 8048	0.0000 2191	0.0000 0121
0.17	0.0957 4121	0.0069 8862	0.0004 5535	0.0000 2786	0.0000 0164
0.18	0.1012 2305	0.0078 1941	0.0005 3931	0.0000 3493	0.0000 0217
0.19	0.1066 8822	0.0086 9500	0.0006 3286	0.0000 4326	0.0000 0284
0.20	0.1121 3672	0.0096 1510	0.0007 3647	0.0000 5299	0.0000 0366
0.21	0.1175 6856	0.0105 7943	0.0008 5062	0.0000 6425	0.0000 0466
0.22	0.1229 8373	0.0115 8770	0.0009 7580	0.0000 7721	0.0000 0587
0.23	0.1283 8223	0.0126 3961	0.0011 1247	0.0000 9201	0.0000 0731
0.24	0.1337 6406	0.0137 3489	0.0012 6109	0.0001 0881	0.0000 0902
0.25	0.1391 2923	0.0148 7324	0.0014 2214	0.0001 2780	0.0000 1104
0.26	0.1444 7774	0.0160 5437	0.0015 9605	0.0001 4914	0.0000 1340
0.27	0.1498 0957	0.0172 7800	0.0017 8328	0.0001 7302	0.0000 1614
0.28	0.1551 2474	0.0185 4383	0.0019 8428	0.0001 9962	0.0000 1931
0.29	0.1604 2324	0.0198 5158	0.0021 9948	0.0002 2914	0.0000 2295
0.30	0.1657 0508	0.0212 0096	0.0024 2933	0.0002 6176	0.0000 2712
0.31	0.1709 7025	0.0225 9168	0.0026 7424	0.0002 9771	0.0000 3187
0.32	0.1762 1875	0.0240 2345	0.0029 3465	0.0003 3718	0.0000 3725
0.33	0.1814 5059	0.0254 9598	0.0032 1097	0.0003 8040	0.0000 4334
0.34	0.1866 6576	0.0270 0899	0.0035 0363	0.0004 2757	0.0000 5018
0.35	0.1918 6426	0.0285 6218	0.0038 1302	0.0004 7893	0.0000 5785
0.36	0.1970 4610	0.0301 5526	0.0041 3956	0.0005 3471	0.0000 6643
0.37	0.2022 1127	0.0317 8796	0.0044 8364	0.0005 9515	0.0000 7598
0.38	0.2073 5977	0.0334 5997	0.0048 4566	0.0006 6047	0.0000 8659
0.39	0.2124 9160	0.0351 7101	0.0052 2601	0.0007 3093	0.0000 9834
0.40	0.2176 0677	0.0369 2080	0.0056 2507	0.0008 0678	0.0001 1132
0.41	0.2227 0528	0.0387 0904	0.0060 4323	0.0008 8826	0.0001 2561
0.42	0.2277 8711	0.0405 3544	0.0064 8085	0.0009 7565	0.0001 4131
0.43	0.2328 5228	0.0423 9972	0.0069 3831	0.0010 6920	0.0001 5853
0.44	0.2379 0078	0.0443 0158	0.0074 1598	0.0011 6918	0.0001 7737
0.45	0.2429 3262	0.0462 4075	0.0079 1421	0.0012 7586	0.0001 9793
0.46	0.2479 4779	0.0482 1692	0.0084 3336	0.0013 8952	0.0002 2032
0.47	0.2529 4629	0.0502 2981	0.0089 7377	0.0015 1043	0.0002 4467
0.48	0.2579 2813	0.0522 7914	0.0095 3580	0.0016 3888	0.0002 7109
0.49	0.2628 9330	0.0543 6461	0.0101 1978	0.0017 7516	0.0002 9971
0.50	0.2678 4180	0.0564 8593	0.0107 2605	0.0019 1955	0.0003 3067

W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
0.51	0.2727 7364	0.0586 4283	0.0113 5493	0.0020 7236	0.0003 6409
0.52	0.2776 8881	0.0608 3499	0.0120 0676	0.0022 3388	0.0004 0011
0.53	0.2825 8731	0.0630 6215	0.0126 8185	0.0024 0441	0.0004 3888
0.54	0.2874 6915	0.0653 2401	0.0133 8051	0.0025 8426	0.0004 8055
0.55	0.2923 3431	0.0676 2028	0.0141 0306	0.0027 7373	0.0005 2526
0.56	0.2971 8282	0.0699 5067	0.0148 4980	0.0029 7314	0.0005 7319
0.57	0.3020 1465	0.0723 1490	0.0156 2104	0.0031 8280	0.0006 2449
0.58	0.3068 2982	0.0747 1267	0.0164 1706	0.0034 0302	0.0006 7932
0.59	0.3116 2833	0.0771 4370	0.0172 3815	0.0036 3414	0.0007 3787
0.60	0.3164 1016	0.0796 0770	0.0180 8461	0.0038 7646	0.0008 0031
0.61	0.3211 7533	0.0821 0437	0.0189 5671	0.0041 3032	0.0008 6682
0.62	0.3259 2383	0.0846 3344	0.0198 5472	0.0043 9605	0.0009 3758
0.63	0.3306 5567	0.0871 9461	0.0207 7892	0.0046 7397	0.0010 1280
0.64	0.3353 7084	0.0897 8759	0.0217 2956	0.0049 6441	0.0010 9267
0.65	0.3400 6934	0.0924 1210	0.0227 0692	0.0052 6773	0.0011 7739
0.66	0.3447 5118	0.0950 6784	0.0237 1125	0.0055 8424	0.0012 6716
0.67	0.3494 1635	0.0977 5453	0.0247 4278	0.0059 1428	0.0013 6221
0.68	0.3540 6485	0.1004 7188	0.0258 0178	0.0062 5822	0.0014 6274
0.69	0.3586 9669	0.1032 1960	0.0268 8848	0.0066 1637	0.0015 6897
0.70	0.3633 1186	0.1059 9740	0.0280 0311	0.0069 8909	0.0016 8115
0.71	0.3679 1036	0.1088 0500	0.0291 4590	0.0073 7673	0.0017 9949
0.72	0.3724 9219	0.1116 4210	0.0303 1709	0.0077 7964	0.0019 2424
0.73	0.3770 5736	0.1145 0841	0.0315 1688	0.0081 9816	0.0020 5563
0.74	0.3816 0587	0.1174 0365	0.0327 4549	0.0086 3264	0.0021 9392
0.75	0.3861 3770	0.1203 2753	0.0340 0314	0.0090 8344	0.0023 3935
0.76	0.3906 5287	0.1232 7976	0.0352 9003	0.0095 5091	0.0024 9218
0.77	0.3951 5137	0.1262 6005	0.0366 0636	0.0100 3541	0.0026 5268
0.78	0.3996 3321	0.1292 6811	0.0379 5232	0.0105 3730	0.0028 2111
0.79	0.4040 9838	0.1323 0365	0.0393 2810	0.0110 5692	0.0029 9775
0.80	0.4085 4688	0.1353 6639	0.0407 3389	0.0115 9464	0.0031 8286
0.81	0.4129 7872	0.1384 5603	0.0421 6987	0.0121 5081	0.0033 7673
0.82	0.4173 9389	0.1415 7229	0.0436 3621	0.0127 2580	0.0035 7966
0.83	0.4217 9239	0.1447 1489	0.0451 3308	0.0133 1996	0.0037 9192
0.84	0.4261 7423	0.1478 8352	0.0466 6065	0.0139 3366	0.0040 1382
0.85	0.4305 3940	0.1510 7790	0.0482 1908	0.0145 6725	0.0042 4566
0.86	0.4348 8790	0.1542 9774	0.0498 0851	0.0152 2110	0.0044 8773
0.87	0.4392 1973	0.1575 4276	0.0514 2911	0.0158 9556	0.0047 4037
0.88	0.4435 3490	0.1608 1266	0.0530 8102	0.0165 9100	0.0050 0387
0.89	0.4478 3341	0.1641 0716	0.0547 6437	0.0173 0778	0.0052 7855
0.90	0.4521 1524	0.1674 2597	0.0564 7931	0.0180 4626	0.0055 6476
0.91	0.4563 8041	0.1707 6880	0.0582 2595	0.0188 0679	0.0058 6280
0.92	0.4606 2891	0.1741 3536	0.0600 0443	0.0195 8974	0.0061 7302
0.93	0.4648 6075	0.1775 2536	0.0618 1487	0.0203 9547	0.0064 9575
0.94	0.4690 7592	0.1809 3851	0.0636 5738	0.0212 2434	0.0068 3134
0.95	0.4732 7442	0.1843 7453	0.0655 3207	0.0220 7671	0.0071 8014
0.96	0.4774 5626	0.1878 3312	0.0674 3904	0.0229 5293	0.0075 4249
0.97	0.4816 2143	0.1913 1400	0.0693 7840	0.0238 5336	0.0079 1875
0.98	0.4857 6993	0.1948 1688	0.0713 5024	0.0247 7835	0.0083 0928
0.99	0.4899 0177	0.1983 4147	0.0733 5465	0.0257 2827	0.0087 1444
1.00	0.4940 1694	0.2018 8748	0.0753 9171	0.0267 0347	0.0091 3461

W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
1.01	0.4981 1544	0.2054 5462	0.0774 6151	0.0277 0429	0.0095 7016
1.02	0.5021 9727	0.2090 4261	0.0795 6412	0.0287 3110	0.0100 2146
1.03	0.5062 6244	0.2126 5115	0.0816 9960	0.0297 8423	0.0104 8889
1.04	0.5103 1095	0.2162 7996	0.0838 6804	0.0308 6405	0.0109 7284
1.05	0.5143 4278	0.2199 2874	0.0860 6947	0.0319 7089	0.0114 7369
1.06	0.5183 5795	0.2235 9722	0.0883 0396	0.0331 0510	0.0119 9184
1.07	0.5223 5645	0.2272 8509	0.0905 7157	0.0342 6703	0.0125 2768
1.08	0.5263 3829	0.2309 9208	0.0928 7232	0.0354 5702	0.0130 8162
1.09	0.5303 0346	0.2347 1789	0.0952 0627	0.0366 7540	0.0136 5405
1.10	0.5342 5196	0.2384 6223	0.0975 7345	0.0379 2252	0.0142 4538
1.11	0.5381 8380	0.2422 2482	0.0999 7389	0.0391 9871	0.0148 5602
1.12	0.5420 9897	0.2460 0537	0.1024 0761	0.0405 0430	0.0154 8638
1.13	0.5459 9747	0.2498 0359	0.1048 7463	0.0418 3963	0.0161 3689
1.14	0.5498 7931	0.2536 1918	0.1073 7497	0.0432 0502	0.0168 0794
1.15	0.5537 4448	0.2574 5187	0.1099 0863	0.0446 0081	0.0174 9998
1.16	0.5575 9298	0.2613 0136	0.1124 7563	0.0460 2730	0.0182 1343
1.17	0.5614 2481	0.2651 6736	0.1150 7597	0.0474 8483	0.0189 4870
1.18	0.5652 3998	0.2690 4959	0.1177 0962	0.0489 7371	0.0197 0624
1.19	0.5690 3849	0.2729 4775	0.1203 7660	0.0504 9425	0.0204 8647
1.20	0.5728 2032	0.2768 6156	0.1230 7688	0.0520 4677	0.0212 8984
1.21	0.5765 8549	0.2807 9073	0.1258 1044	0.0536 3158	0.0221 1677
1.22	0.5803 3400	0.2847 3497	0.1285 7725	0.0552 4899	0.0229 6772
1.23	0.5840 6583	0.2886 9399	0.1313 7729	0.0568 9929	0.0238 4311
1.24	0.5877 8100	0.2926 6751	0.1342 1053	0.0585 8278	0.0247 4341
1.25	0.5914 7950	0.2966 5523	0.1370 7691	0.0602 9976	0.0256 6904
1.26	0.5951 6134	0.3006 5686	0.1399 7640	0.0620 5052	0.0266 2047
1.27	0.5988 2651	0.3046 7213	0.1429 0895	0.0638 3535	0.0275 9815
1.28	0.6024 7501	0.3087 0073	0.1458 7449	0.0656 5453	0.0286 0251
1.29	0.6061 0685	0.3127 4238	0.1488 7298	0.0675 0834	0.0296 3403
1.30	0.6097 2202	0.3167 9679	0.1519 0434	0.0693 9707	0.0306 9315
1.31	0.6133 2052	0.3208 6367	0.1549 6851	0.0713 2097	0.0317 8032
1.32	0.6169 0236	0.3249 4274	0.1580 6540	0.0732 8033	0.0328 9602
1.33	0.6204 6752	0.3290 3370	0.1611 9495	0.0752 7540	0.0340 4068
1.34	0.6240 1603	0.3331 3627	0.1643 5706	0.0773 0645	0.0352 1479
1.35	0.6275 4786	0.3372 5015	0.1675 5165	0.0793 7372	0.0364 1878
1.36	0.6310 6303	0.3413 7507	0.1707 7861	0.0814 7747	0.0376 5314
1.37	0.6345 6154	0.3455 1072	0.1740 3786	0.0836 1795	0.0389 1830
1.38	0.6380 4337	0.3496 5683	0.1773 2928	0.0857 9539	0.0402 1475
1.39	0.6415 0854	0.3538 1310	0.1806 5276	0.0880 1003	0.0415 4293
1.40	0.6449 5704	0.3579 7924	0.1840 0819	0.0902 6211	0.0429 0332
1.41	0.6483 8888	0.3621 5497	0.1873 9545	0.0925 5184	0.0442 9637
1.42	0.6518 0405	0.3663 3999	0.1908 1441	0.0948 7946	0.0457 2255
1.43	0.6552 0255	0.3705 3403	0.1942 6495	0.0972 4517	0.0471 8231
1.44	0.6585 8439	0.3747 3678	0.1977 4692	0.0996 4919	0.0486 7611
1.45	0.6619 4956	0.3789 4796	0.2012 6020	0.1020 9172	0.0502 0443
1.46	0.6652 9806	0.3831 6729	0.2048 0462	0.1045 7296	0.0517 6771
1.47	0.6686 2990	0.3873 9447	0.2083 8005	0.1070 9311	0.0533 6641
1.48	0.6719 4506	0.3916 2921	0.2119 8633	0.1096 5235	0.0550 0100
1.49	0.6752 4357	0.3958 7123	0.2156 2329	0.1122 5087	0.0566 7192
1.50	0.6785 2540	0.4001 2024	0.2192 9078	0.1148 8884	0.0583 7963

W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
1.51	0.6817 9057	0.4043 7594	0.2229 8861	0.1175 6643	0.0601 2459
1.52	0.6850 3908	0.4086 3806	0.2267 1663	0.1202 8381	0.0619 0725
1.53	0.6882 7091	0.4129 0630	0.2304 7464	0.1230 4114	0.0637 2804
1.54	0.6914 8608	0.4171 8037	0.2342 6246	0.1258 3856	0.0655 8743
1.55	0.6946 8458	0.4214 5998	0.2380 7991	0.1286 7622	0.0674 8586
1.56	0.6978 6642	0.4257 4485	0.2419 2678	0.1315 5427	0.0694 2376
1.57	0.7010 3159	0.4300 3469	0.2458 0288	0.1344 7283	0.0714 0158
1.58	0.7041 8009	0.4343 2920	0.2497 0800	0.1374 3203	0.0734 1976
1.59	0.7073 1193	0.4386 2810	0.2536 4193	0.1404 3200	0.0754 7872
1.60	0.7104 2710	0.4429 3111	0.2576 0445	0.1434 7283	0.0775 7891
1.61	0.7135 2560	0.4472 3792	0.2615 9535	0.1465 5464	0.0797 2073
1.62	0.7166 0744	0.4515 4826	0.2656 1440	0.1496 7752	0.0819 0463
1.63	0.7196 7261	0.4558 6184	0.2696 6137	0.1528 4157	0.0841 3101
1.64	0.7227 2111	0.4601 7836	0.2737 3603	0.1560 4687	0.0864 0030
1.65	0.7257 5294	0.4644 9754	0.2778 3813	0.1592 9349	0.0887 1290
1.66	0.7287 6811	0.4688 1908	0.2819 6743	0.1625 8151	0.0910 6923
1.67	0.7317 6662	0.4731 4271	0.2861 2369	0.1659 1098	0.0934 6968
1.68	0.7347 4845	0.4774 6812	0.2903 0663	0.1692 8197	0.0959 1466
1.69	0.7377 1362	0.4817 9504	0.2945 1601	0.1726 9450	0.0984 0455
1.70	0.7406 6212	0.4861 2318	0.2987 5156	0.1761 4864	0.1009 3975
1.71	0.7435 9396	0.4904 5224	0.3030 1301	0.1796 4439	0.1035 2064
1.72	0.7465 0913	0.4947 8193	0.3073 0008	0.1831 8179	0.1061 4758
1.73	0.7494 0763	0.4991 1197	0.3116 1250	0.1867 6085	0.1088 2097
1.74	0.7522 8947	0.5034 4208	0.3159 4998	0.1903 8158	0.1115 4115
1.75	0.7551 5464	0.5077 7195	0.3203 1222	0.1940 4397	0.1143 0850
1.76	0.7580 0314	0.5121 0130	0.3246 9894	0.1977 4802	0.1171 2335
1.77	0.7608 3498	0.5164 2985	0.3291 0983	0.2014 9369	0.1199 8607
1.78	0.7636 5015	0.5207 5731	0.3335 4459	0.2052 8097	0.1228 9698
1.79	0.7664 4865	0.5250 8337	0.3380 0290	0.2091 0982	0.1258 5641
1.80	0.7692 3048	0.5294 0777	0.3424 8446	0.2129 8020	0.1288 6471
1.81	0.7719 9565	0.5337 3020	0.3469 8894	0.2168 9204	0.1319 2217
1.82	0.7747 4416	0.5380 5039	0.3515 1602	0.2208 4528	0.1350 2911
1.83	0.7774 7599	0.5423 6803	0.3560 6537	0.2248 3986	0.1381 8584
1.84	0.7801 9116	0.5466 8285	0.3606 3665	0.2288 7569	0.1413 9263
1.85	0.7828 8966	0.5509 9455	0.3652 2952	0.2329 5268	0.1446 4979
1.86	0.7855 7150	0.5553 0285	0.3698 4364	0.2370 7073	0.1479 5758
1.87	0.7882 3667	0.5596 0745	0.3744 7865	0.2412 2973	0.1513 1627
1.88	0.7908 8517	0.5639 0807	0.3791 3421	0.2454 2956	0.1547 2613
1.89	0.7935 1701	0.5682 0442	0.3838 0995	0.2496 7010	0.1581 8739
1.90	0.7961 3218	0.5724 9621	0.3885 0550	0.2539 5119	0.1617 0029
1.91	0.7987 3068	0.5767 8315	0.3932 2050	0.2582 7270	0.1652 6508
1.92	0.8013 1252	0.5810 6495	0.3979 5457	0.2626 3447	0.1688 8195
1.93	0.8038 7769	0.5853 4133	0.4027 0733	0.2670 3632	0.1725 5113
1.94	0.8064 2619	0.5896 1200	0.4074 7840	0.2714 7809	0.1762 7281
1.95	0.8089 5802	0.5938 7666	0.4122 6738	0.2759 5957	0.1800 4717
1.96	0.8114 7319	0.5981 3503	0.4170 7389	0.2804 8057	0.1838 7439
1.97	0.8139 7170	0.6023 8682	0.4218 9751	0.2850 4088	0.1877 5464
1.98	0.8164 5353	0.6066 3174	0.4267 3785	0.2896 4029	0.1916 8806
1.99	0.8189 1870	0.6108 6950	0.4315 9449	0.2942 7855	0.1956 7481
2.00	0.8213 6721	0.6150 9982	0.4364 6703	0.2989 5544	0.1997 1499

W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
2.01	0.8237 9904	0.6193 2240	0.4413 5503	0.3036 7068	0.2038 0874
2.02	0.8262 1421	0.6235 3696	0.4462 5808	0.3084 2403	0.2079 5615
2.03	0.8286 1271	0.6277 4321	0.4511 7574	0.3132 1521	0.2121 5731
2.04	0.8309 9455	0.6319 4085	0.4561 0758	0.3180 4393	0.2164 1230
2.05	0.8333 5972	0.6361 2961	0.4610 5316	0.3229 0990	0.2207 2118
2.06	0.8357 0822	0.6403 0918	0.4660 1203	0.3278 1281	0.2250 8400
2.07	0.8380 4006	0.6444 7929	0.4709 8375	0.3327 5233	0.2295 0080
2.08	0.8403 5523	0.6486 3964	0.4759 6786	0.3377 2814	0.2339 7158
2.09	0.8426 5373	0.6527 8995	0.4809 6389	0.3427 3990	0.2384 9637
2.10	0.8449 3557	0.6569 2993	0.4859 7139	0.3477 8725	0.2430 7514
2.11	0.8472 0073	0.6610 5928	0.4909 8988	0.3528 6982	0.2477 0788
2.12	0.8494 4924	0.6651 7773	0.4960 1889	0.3579 8725	0.2523 9454
2.13	0.8516 8107	0.6692 8497	0.5010 5794	0.3631 3913	0.2571 3507
2.14	0.8538 9624	0.6733 8073	0.5061 0654	0.3683 2506	0.2619 2938
2.15	0.8560 9475	0.6774 6471	0.5111 6420	0.3735 4464	0.2667 7741
2.16	0.8582 7658	0.6815 3663	0.5162 3043	0.3787 9744	0.2716 7902
2.17	0.8604 4175	0.6855 9619	0.5213 0473	0.3840 8301	0.2766 3412
2.18	0.8625 9025	0.6896 4311	0.5263 8659	0.3894 0091	0.2816 4254
2.19	0.8647 2209	0.6936 7709	0.5314 7550	0.3947 5068	0.2867 0414
2.20	0.8668 3726	0.6976 9786	0.5365 7094	0.4001 3183	0.2918 1874
2.21	0.8689 3576	0.7017 0512	0.5416 7241	0.4055 4388	0.2969 8613
2.22	0.8710 1760	0.7056 9858	0.5467 7936	0.4109 8633	0.3022 0612
2.23	0.8730 8277	0.7096 7796	0.5518 9128	0.4164 5865	0.3074 7846
2.24	0.8751 3127	0.7136 4296	0.5570 0763	0.4219 6034	0.3128 0291
2.25	0.8771 6311	0.7175 9330	0.5621 2785	0.4274 9083	0.3181 7919
2.26	0.8791 7828	0.7215 2869	0.5672 5143	0.4330 4958	0.3236 0701
2.27	0.8811 7678	0.7254 4883	0.5723 7779	0.4386 3603	0.3290 8606
2.28	0.8831 5861	0.7293 5345	0.5775 0638	0.4442 4959	0.3346 1601
2.29	0.8851 2378	0.7332 4225	0.5826 3665	0.4498 8966	0.3401 9650
2.30	0.8870 7229	0.7371 1494	0.5877 6804	0.4555 5564	0.3458 2716
2.31	0.8890 0412	0.7409 7124	0.5928 9996	0.4612 4691	0.3515 0759
2.32	0.8909 1929	0.7448 1085	0.5980 3185	0.4669 6283	0.3572 3738
2.33	0.8928 1779	0.7486 3349	0.6031 6312	0.4727 0276	0.3630 1608
2.34	0.8946 9963	0.7524 3887	0.6082 9319	0.4784 6602	0.3688 4323
2.35	0.8965 6480	0.7562 2670	0.6134 2147	0.4842 5195	0.3747 1836
2.36	0.8984 1330	0.7599 9669	0.6185 4737	0.4900 5984	0.3806 4094
2.37	0.9002 4514	0.7637 4855	0.6236 7028	0.4958 8900	0.3866 1044
2.38	0.9020 6031	0.7674 8200	0.6287 8960	0.5017 3870	0.3926 2631
2.39	0.9038 5881	0.7711 9674	0.6339 0472	0.5076 0822	0.3986 8797
2.40	0.9056 4065	0.7748 9249	0.6390 1502	0.5134 9679	0.4047 9481
2.41	0.9074 0582	0.7785 6896	0.6441 1989	0.5194 0366	0.4109 4621
2.42	0.9091 5432	0.7822 2585	0.6492 1869	0.5253 2805	0.4171 4150
2.43	0.9108 8615	0.7858 6289	0.6543 1080	0.5312 6916	0.4233 8000
2.44	0.9126 0132	0.7894 7978	0.6593 9559	0.5372 2618	0.4296 6101
2.45	0.9142 9983	0.7930 7623	0.6644 7241	0.5431 9830	0.4359 8380
2.46	0.9159 8166	0.7966 5196	0.6695 4061	0.5491 8467	0.4423 4759
2.47	0.9176 4683	0.8002 0667	0.6745 9956	0.5551 8445	0.4487 5161
2.48	0.9192 9533	0.8037 4008	0.6796 4859	0.5611 9675	0.4551 9504
2.49	0.9209 2717	0.8072 5190	0.6846 8704	0.5672 2069	0.4616 7703
2.50	0.9225 4234	0.8107 4184	0.6897 1424	0.5732 5539	0.4681 9671

W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
2.51	0.9241 4084	0.8142 0961	0.6947 2954	0.5792 9991	0.4747 5319
2.52	0.9257 2268	0.8176 5492	0.6997 3224	0.5853 5333	0.4813 4553
2.53	0.9272 8785	0.8210 7748	0.7047 2168	0.5914 1470	0.4879 7277
2.54	0.9288 3635	0.8244 7702	0.7096 9717	0.5974 8305	0.4946 3393
2.55	0.9303 6819	0.8278 5322	0.7146 5801	0.6035 5741	0.5013 2798
2.56	0.9318 8336	0.8312 0582	0.7196 0351	0.6096 3679	0.5080 5389
2.57	0.9333 8186	0.8345 3451	0.7245 3297	0.6157 2017	0.5148 1056
2.58	0.9348 6369	0.8378 3902	0.7294 4569	0.6218 0652	0.5215 9689
2.59	0.9363 2886	0.8411 1905	0.7343 4096	0.6278 9479	0.5284 1173
2.60	0.9377 7737	0.8443 7431	0.7392 1806	0.6339 8394	0.5352 5390
2.61	0.9392 0920	0.8476 0451	0.7440 7626	0.6400 7288	0.5421 2221
2.62	0.9406 2437	0.8508 0937	0.7489 1486	0.6461 6051	0.5490 1541
2.63	0.9420 2287	0.8539 8860	0.7537 3310	0.6522 4572	0.5559 3222
2.64	0.9434 0471	0.8571 4190	0.7585 3027	0.6583 2740	0.5628 7134
2.65	0.9447 6988	0.8602 6900	0.7633 0562	0.6644 0438	0.5698 3142
2.66	0.9461 1838	0.8633 6960	0.7680 5840	0.6704 7552	0.5768 1109
2.67	0.9474 5022	0.8664 4341	0.7727 8787	0.6765 3963	0.5838 0894
2.68	0.9487 6539	0.8694 9014	0.7774 9327	0.6825 9551	0.5908 2352
2.69	0.9500 6389	0.8725 0951	0.7821 7384	0.6886 4196	0.5978 5335
2.70	0.9513 4573	0.8755 0122	0.7868 2881	0.6946 7773	0.6048 9692
2.71	0.9526 1090	0.8784 6499	0.7914 5741	0.7007 0159	0.6119 5265
2.72	0.9538 5940	0.8814 0053	0.7960 5888	0.7067 1227	0.6190 1898
2.73	0.9550 9123	0.8843 0756	0.8006 3242	0.7127 0847	0.6260 9425
2.74	0.9563 0640	0.8871 8577	0.8051 7726	0.7186 8891	0.6331 7682
2.75	0.9575 0491	0.8900 3489	0.8096 9260	0.7246 5226	0.6402 6496
2.76	0.9586 8674	0.8928 5462	0.8141 7765	0.7305 9718	0.6473 5695
2.77	0.9598 5191	0.8956 4467	0.8186 3161	0.7365 2232	0.6544 5099
2.78	0.9610 0041	0.8984 0476	0.8230 5367	0.7424 2630	0.6615 4526
2.79	0.9621 3225	0.9011 3461	0.8274 4302	0.7483 0773	0.6686 3791
2.80	0.9632 4742	0.9038 3391	0.8317 9885	0.7541 6519	0.6757 2702
2.81	0.9643 4592	0.9065 0238	0.8361 2034	0.7599 9727	0.6828 1066
2.82	0.9654 2776	0.9091 3973	0.8404 0666	0.7658 0251	0.6898 8684
2.83	0.9664 9293	0.9117 4568	0.8446 5699	0.7715 7945	0.6969 5352
2.84	0.9675 4143	0.9143 1993	0.8488 7048	0.7773 2659	0.7040 0866
2.85	0.9685 7327	0.9168 6220	0.8530 4629	0.7830 4244	0.7110 5012
2.86	0.9695 8844	0.9193 7220	0.8571 8359	0.7887 2547	0.7180 7576
2.87	0.9705 8694	0.9218 4964	0.8612 8153	0.7943 7415	0.7250 8339
2.88	0.9715 6878	0.9242 9422	0.8653 3923	0.7999 8689	0.7320 7075
2.89	0.9725 3394	0.9267 0567	0.8693 5586	0.8055 6214	0.7390 3556
2.90	0.9734 8245	0.9290 8369	0.8733 3054	0.8110 9828	0.7459 7550
2.91	0.9744 1428	0.9314 2800	0.8772 6239	0.8165 9370	0.7528 8818
2.92	0.9753 2945	0.9337 3829	0.8811 5056	0.8220 4675	0.7597 7118
2.93	0.9762 2796	0.9360 1430	0.8849 9415	0.8274 5578	0.7666 2204
2.94	0.9771 0979	0.9382 5573	0.8887 9228	0.8328 1911	0.7734 3824
2.95	0.9779 7496	0.9404 6228	0.8925 4406	0.8381 3504	0.7802 1721
2.96	0.9788 2346	0.9426 3368	0.8962 4859	0.8434 0185	0.7869 5636
2.97	0.9796 5530	0.9447 6963	0.8999 0498	0.8486 1781	0.7936 5301
2.98	0.9804 7047	0.9468 6984	0.9035 1232	0.8537 8115	0.8003 0447
2.99	0.9812 6897	0.9489 3402	0.9070 6971	0.8588 9009	0.8069 0798
3.00	0.9820 5081	0.9509 6189	0.9105 7621	0.8639 4284	0.8134 6074

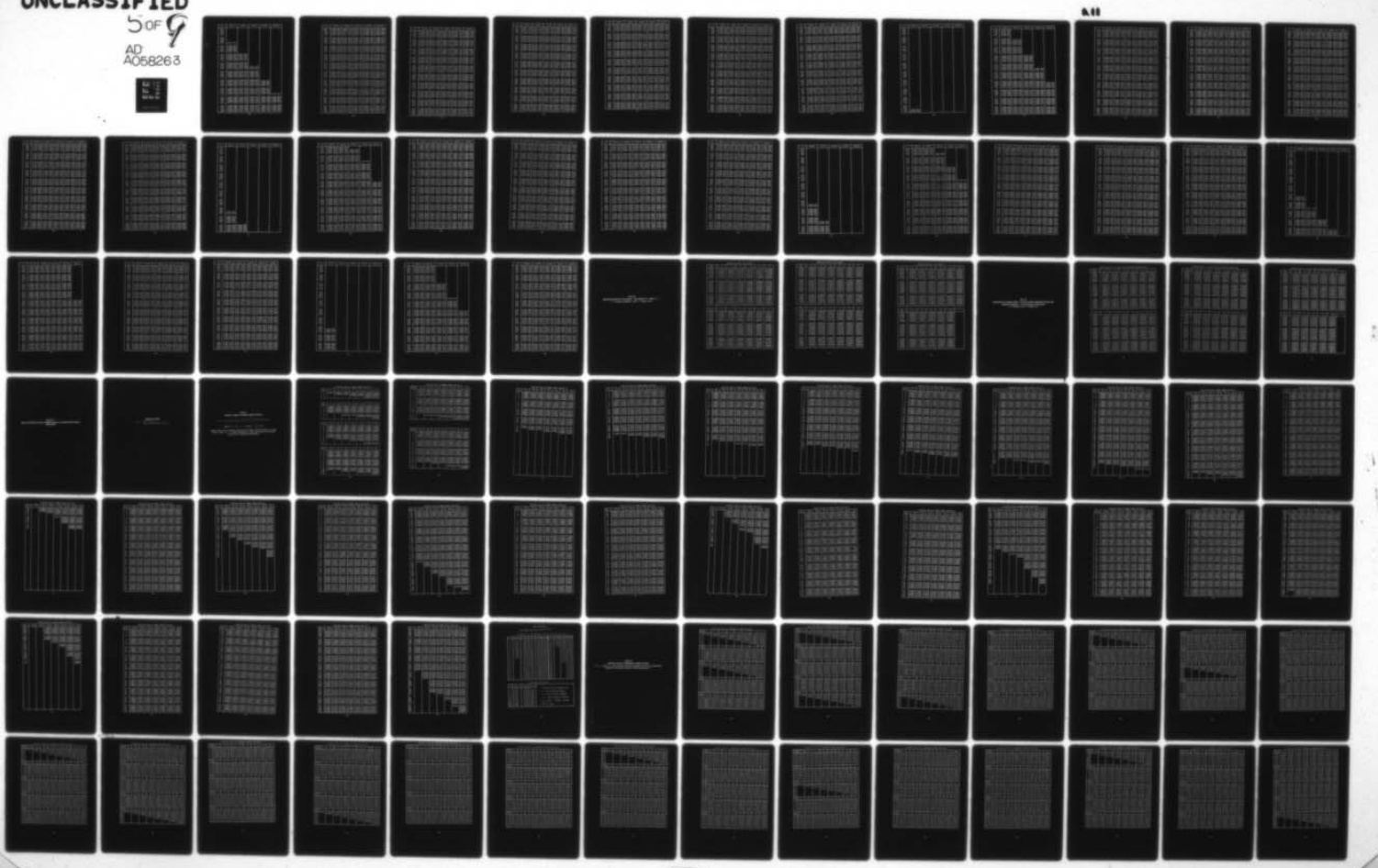
W	P(W,2)	P(W,3)	P(W,4)	P(W,5)	P(W,6)
3.01	0.9828 1598	0.9529 5316	0.9140 3092	0.8689 3758	0.8199 5988
3.02	0.9835 6448	0.9549 0754	0.9174 3291	0.8738 7246	0.8264 0251
3.03	0.9842 9632	0.9568 2474	0.9207 8125	0.8787 4562	0.8327 8567
3.04	0.9850 1148	0.9587 0447	0.9240 7501	0.8835 5519	0.8391 0635
3.05	0.9857 0999	0.9605 4644	0.9273 1323	0.8882 9925	0.8453 6149
3.06	0.9863 9182	0.9623 5037	0.9304 9499	0.8929 7590	0.8515 4798
3.07	0.9870 5699	0.9641 1596	0.9336 1933	0.8975 8317	0.8576 6265
3.08	0.9877 0550	0.9658 4293	0.9366 8528	0.9021 1911	0.8637 0229
3.09	0.9883 3733	0.9675 3099	0.9396 9191	0.9065 8173	0.8696 6363
3.10	0.9889 5250	0.9691 7984	0.9426 3823	0.9109 6902	0.8755 4334
3.11	0.9895 5100	0.9707 8921	0.9455 2328	0.9152 7896	0.8813 3803
3.12	0.9901 3284	0.9723 5880	0.9483 4608	0.9195 0948	0.8870 4428
3.13	0.9906 9801	0.9738 8832	0.9511 0565	0.9236 5852	0.8926 5858
3.14	0.9912 4651	0.9753 7749	0.9538 0102	0.9277 2398	0.8981 7740
3.15	0.9917 7835	0.9768 2601	0.9564 3118	0.9317 0375	0.9035 9712
3.16	0.9922 9352	0.9782 3360	0.9589 9514	0.9355 9569	0.9089 1408
3.17	0.9927 9202	0.9795 9997	0.9614 9190	0.9393 9764	0.9141 2457
3.18	0.9932 7386	0.9809 2483	0.9639 2047	0.9431 0742	0.9192 2479
3.19	0.9937 3903	0.9822 0789	0.9662 7982	0.9467 2282	0.9242 1092
3.20	0.9941 8753	0.9834 4886	0.9685 6894	0.9502 4162	0.9290 7905
3.21	0.9946 1936	0.9846 4746	0.9707 8681	0.9536 6156	0.9338 2524
3.22	0.9950 3453	0.9858 0339	0.9729 3241	0.9569 8038	0.9384 4545
3.23	0.9954 3304	0.9869 1637	0.9750 0470	0.9601 9579	0.9429 3561
3.24	0.9958 1487	0.9879 8611	0.9770 0266	0.9633 0546	0.9472 9159
3.25	0.9961 8004	0.9890 1232	0.9789 2524	0.9663 0705	0.9515 0917
3.26	0.9965 2854	0.9899 9470	0.9807 7139	0.9691 9822	0.9555 8410
3.27	0.9968 6038	0.9909 3298	0.9825 4007	0.9719 7656	0.9595 1204
3.28	0.9971 7555	0.9918 2686	0.9842 3022	0.9746 3967	0.9632 8860
3.29	0.9974 7405	0.9926 7606	0.9858 4078	0.9771 8512	0.9669 0933
3.30	0.9977 5589	0.9934 8028	0.9873 7069	0.9796 1046	0.9703 6970
3.31	0.9980 2106	0.9942 3924	0.9888 1887	0.9819 1321	0.9736 6513
3.32	0.9982 6956	0.9949 5265	0.9901 8425	0.9840 9086	0.9767 9097
3.33	0.9985 0140	0.9956 2022	0.9914 6575	0.9861 4090	0.9797 4250
3.34	0.9987 1657	0.9962 4166	0.9926 6229	0.9880 6077	0.9825 1493
3.35	0.9989 1507	0.9968 1668	0.9937 7277	0.9898 4790	0.9851 0341
3.36	0.9990 9690	0.9973 4499	0.9947 9610	0.9914 9970	0.9875 0303
3.37	0.9992 6207	0.9978 2631	0.9957 3117	0.9930 1354	0.9897 0878
3.38	0.9994 1058	0.9982 6035	0.9965 7690	0.9943 8679	0.9917 1562
3.39	0.9995 4241	0.9986 4681	0.9973 3215	0.9956 1677	0.9935 1841
3.40	0.9996 5758	0.9989 8542	0.9979 9583	0.9967 0079	0.9951 1196
3.41	0.9997 5608	0.9992 7587	0.9985 6680	0.9976 3615	0.9964 9099
3.42	0.9998 3792	0.9995 1789	0.9990 4395	0.9984 2008	0.9976 5017
3.43	0.9999 0309	0.9997 1118	0.9994 2614	0.9990 4984	0.9985 8409
3.44	0.9999 5159	0.9998 5545	0.9997 1224	0.9995 2263	0.9992 8726
3.45	0.9999 8343	0.9999 5042	0.9999 0111	0.9998 3563	0.9997 5412
3.460	0.9999 9860	0.9999 9580	0.9999 9160	0.9999 8601	0.9999 7904
3.461	0.9999 9920	0.9999 9760	0.9999 9520	0.9999 9200	0.9999 8800
3.462	0.9999 9963	0.9999 9890	0.9999 9779	0.9999 9632	0.9999 9449
3.463	0.9999 9990	0.9999 9970	0.9999 9939	0.9999 9899	0.9999 9848
3.464	1.0000 0000	1.0000 0000	0.9999 9999	0.9999 9999	0.9999 9999

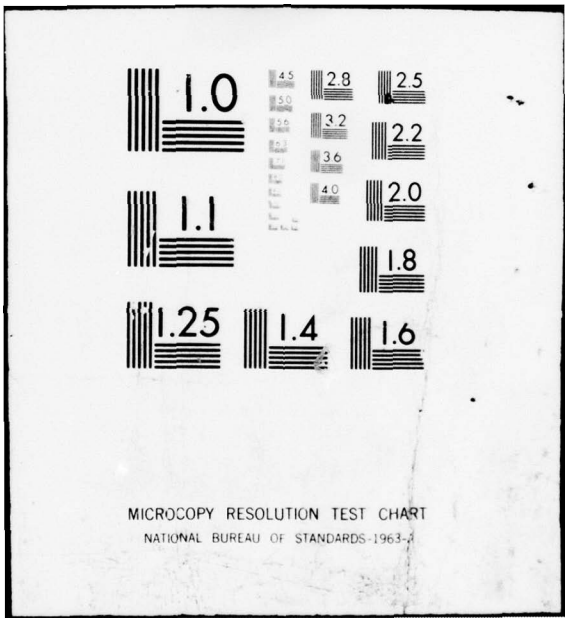
AD-A058 263 AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OHIO F/G 12/1
ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION. VOLUM--ETC(U)
1970 H L HARTER

UNCLASSIFIED

5 OF 9

AD A058263




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
0.01					
0.02					
0.03					
0.04					
0.05					
0.06					
0.07					
0.08					
0.09					
0.10	0.0000 0000				
0.11	0.0000 0001				
0.12	0.0000 0001				
0.13	0.0000 0002				
0.14	0.0000 0003				
0.15	0.0000 0004				
0.16	0.0000 0007	0.0000 0000			
0.17	0.0000 0009	0.0000 0001			
0.18	0.0000 0013	0.0000 0001			
0.19	0.0000 0018	0.0000 0001			
0.20	0.0000 0025	0.0000 0002			
0.21	0.0000 0033	0.0000 0002			
0.22	0.0000 0043	0.0000 0003			
0.23	0.0000 0057	0.0000 0004			
0.24	0.0000 0073	0.0000 0006	0.0000 0000		
0.25	0.0000 0093	0.0000 0008	0.0000 0001		
0.26	0.0000 0117	0.0000 0010	0.0000 0001		
0.27	0.0000 0146	0.0000 0013	0.0000 0001		
0.28	0.0000 0182	0.0000 0017	0.0000 0002		
0.29	0.0000 0224	0.0000 0021	0.0000 0002		
0.30	0.0000 0273	0.0000 0027	0.0000 0003		
0.31	0.0000 0332	0.0000 0034	0.0000 0003		
0.32	0.0000 0401	0.0000 0042	0.0000 0004	0.0000 0000	
0.33	0.0000 0480	0.0000 0052	0.0000 0006	0.0000 0001	
0.34	0.0000 0573	0.0000 0064	0.0000 0007	0.0000 0001	
0.35	0.0000 0680	0.0000 0078	0.0000 0009	0.0000 0001	
0.36	0.0000 0803	0.0000 0095	0.0000 0011	0.0000 0001	
0.37	0.0000 0944	0.0000 0115	0.0000 0014	0.0000 0002	
0.38	0.0000 1105	0.0000 0138	0.0000 0017	0.0000 0002	
0.39	0.0000 1288	0.0000 0165	0.0000 0021	0.0000 0003	
0.40	0.0000 1495	0.0000 0197	0.0000 0026	0.0000 0003	0.0000 0000
0.41	0.0000 1729	0.0000 0233	0.0000 0031	0.0000 0004	0.0000 0001
0.42	0.0000 1992	0.0000 0275	0.0000 0037	0.0000 0005	0.0000 0001
0.43	0.0000 2288	0.0000 0324	0.0000 0045	0.0000 0006	0.0000 0001
0.44	0.0000 2619	0.0000 0379	0.0000 0054	0.0000 0008	0.0000 0001
0.45	0.0000 2989	0.0000 0443	0.0000 0065	0.0000 0009	0.0000 0001
0.46	0.0000 3401	0.0000 0515	0.0000 0077	0.0000 0011	0.0000 0002
0.47	0.0000 3859	0.0000 0597	0.0000 0091	0.0000 0014	0.0000 0002
0.48	0.0000 4366	0.0000 0689	0.0000 0107	0.0000 0016	0.0000 0002
0.49	0.0000 4927	0.0000 0794	0.0000 0126	0.0000 0020	0.0000 0003
0.50	0.0000 5546	0.0000 0912	0.0000 0148	0.0000 0024	0.0000 0004

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
0.51	0.0000 6229	0.0000 1045	0.0000 0173	0.0000 0028	0.0000 0005
0.52	0.0000 6978	0.0000 1194	0.0000 0201	0.0000 0033	0.0000 0006
0.53	0.0000 7801	0.0000 1360	0.0000 0233	0.0000 0040	0.0000 0007
0.54	0.0000 8702	0.0000 1545	0.0000 0270	0.0000 0047	0.0000 0008
0.55	0.0000 9687	0.0000 1752	0.0000 0312	0.0000 0055	0.0000 0010
0.56	0.0001 0762	0.0000 1982	0.0000 0359	0.0000 0064	0.0000 0011
0.57	0.0001 1934	0.0000 2236	0.0000 0413	0.0000 0075	0.0000 0014
0.58	0.0001 3208	0.0000 2519	0.0000 0473	0.0000 0088	0.0000 0016
0.59	0.0001 4593	0.0000 2830	0.0000 0541	0.0000 0102	0.0000 0019
0.60	0.0001 6094	0.0000 3174	0.0000 0617	0.0000 0118	0.0000 0023
0.61	0.0001 7720	0.0000 3553	0.0000 0702	0.0000 0137	0.0000 0026
0.62	0.0001 9479	0.0000 3969	0.0000 0797	0.0000 0158	0.0000 0031
0.63	0.0002 1380	0.0000 4427	0.0000 0903	0.0000 0182	0.0000 0036
0.64	0.0002 3429	0.0000 4928	0.0000 1021	0.0000 0209	0.0000 0042
0.65	0.0002 5638	0.0000 5476	0.0000 1152	0.0000 0240	0.0000 0049
0.66	0.0002 8015	0.0000 6075	0.0000 1298	0.0000 0274	0.0000 0057
0.67	0.0003 0569	0.0000 6729	0.0000 1459	0.0000 0313	0.0000 0066
0.68	0.0003 3312	0.0000 7442	0.0000 1638	0.0000 0356	0.0000 0077
0.69	0.0003 6253	0.0000 8217	0.0000 1835	0.0000 0405	0.0000 0089
0.70	0.0003 9404	0.0000 9060	0.0000 2053	0.0000 0460	0.0000 0102
0.71	0.0004 2776	0.0000 9975	0.0000 2292	0.0000 0521	0.0000 0117
0.72	0.0004 6381	0.0001 0968	0.0000 2555	0.0000 0588	0.0000 0134
0.73	0.0005 0231	0.0001 2042	0.0000 2845	0.0000 0664	0.0000 0154
0.74	0.0005 4339	0.0001 3204	0.0000 3162	0.0000 0748	0.0000 0175
0.75	0.0005 8718	0.0001 4460	0.0000 3509	0.0000 0842	0.0000 0200
0.76	0.0006 3382	0.0001 5815	0.0000 3889	0.0000 0945	0.0000 0227
0.77	0.0006 8344	0.0001 7277	0.0000 4304	0.0000 1060	0.0000 0258
0.78	0.0007 3620	0.0001 8850	0.0000 4756	0.0000 1186	0.0000 0293
0.79	0.0007 9224	0.0002 0544	0.0000 5250	0.0000 1326	0.0000 0332
0.80	0.0008 5172	0.0002 2364	0.0000 5787	0.0000 1480	0.0000 0375
0.81	0.0009 1480	0.0002 4319	0.0000 6371	0.0000 1650	0.0000 0423
0.82	0.0009 8164	0.0002 6415	0.0000 7005	0.0000 1836	0.0000 0477
0.83	0.0010 5241	0.0002 8663	0.0000 7694	0.0000 2041	0.0000 0536
0.84	0.0011 2730	0.0003 1070	0.0000 8440	0.0000 2266	0.0000 0603
0.85	0.0012 0648	0.0003 3645	0.0000 9247	0.0000 2512	0.0000 0676
0.86	0.0012 9013	0.0003 6398	0.0001 0121	0.0000 2782	0.0000 0758
0.87	0.0013 7845	0.0003 9339	0.0001 1065	0.0000 3077	0.0000 0847
0.88	0.0014 7163	0.0004 2477	0.0001 2084	0.0000 3399	0.0000 0947
0.89	0.0015 6988	0.0004 5824	0.0001 3184	0.0000 3750	0.0000 1056
0.90	0.0016 7341	0.0004 9391	0.0001 4369	0.0000 4132	0.0000 1177
0.91	0.0017 8242	0.0005 3188	0.0001 5644	0.0000 4549	0.0000 1310
0.92	0.0018 9714	0.0005 7229	0.0001 7017	0.0000 5002	0.0000 1457
0.93	0.0020 1780	0.0006 1525	0.0001 8491	0.0000 5494	0.0000 1617
0.94	0.0021 4461	0.0006 6089	0.0002 0075	0.0000 6029	0.0000 1794
0.95	0.0022 7783	0.0007 0934	0.0002 1775	0.0000 6608	0.0000 1987
0.96	0.0024 1768	0.0007 6075	0.0002 3597	0.0000 7236	0.0000 2199
0.97	0.0025 6443	0.0008 1526	0.0002 5550	0.0000 7916	0.0000 2430
0.98	0.0027 1832	0.0008 7302	0.0002 7640	0.0000 8652	0.0000 2683
0.99	0.0028 7962	0.0009 3417	0.0002 9876	0.0000 9446	0.0000 2959
1.00	0.0030 4858	0.0009 9888	0.0003 2266	0.0001 0305	0.0000 3261

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
1.01	0.0032 2549	0.0010 6732	0.0003 4818	0.0001 1230	0.0000 3589
1.02	0.0034 1062	0.0011 3965	0.0003 7543	0.0001 2228	0.0000 3946
1.03	0.0036 0426	0.0012 1604	0.0004 0450	0.0001 3304	0.0000 4335
1.04	0.0038 0670	0.0012 9669	0.0004 3548	0.0001 4461	0.0000 4758
1.05	0.0040 1823	0.0013 8178	0.0004 6848	0.0001 5705	0.0000 5217
1.06	0.0042 3916	0.0014 7149	0.0005 0361	0.0001 7043	0.0000 5714
1.07	0.0044 6980	0.0015 6604	0.0005 4099	0.0001 8479	0.0000 6254
1.08	0.0047 1047	0.0016 6562	0.0005 8072	0.0002 0020	0.0000 6839
1.09	0.0049 6148	0.0017 7046	0.0006 2294	0.0002 1673	0.0000 7472
1.10	0.0052 2318	0.0018 8075	0.0006 6777	0.0002 3445	0.0000 8156
1.11	0.0054 9588	0.0019 9674	0.0007 1534	0.0002 5342	0.0000 8896
1.12	0.0057 7995	0.0021 1866	0.0007 6579	0.0002 7372	0.0000 9694
1.13	0.0060 7571	0.0022 4673	0.0008 1927	0.0002 9543	0.0001 0556
1.14	0.0063 8354	0.0023 8121	0.0008 7593	0.0003 1863	0.0001 1485
1.15	0.0067 0378	0.0025 2235	0.0009 3591	0.0003 4342	0.0001 2487
1.16	0.0070 3682	0.0026 7041	0.0009 9938	0.0003 6987	0.0001 3565
1.17	0.0073 8301	0.0028 2565	0.0010 6651	0.0003 9809	0.0001 4725
1.18	0.0077 4275	0.0029 8835	0.0011 3747	0.0004 2818	0.0001 5972
1.19	0.0081 1642	0.0031 5879	0.0012 1243	0.0004 6023	0.0001 7312
1.20	0.0085 0442	0.0033 3725	0.0012 9159	0.0004 9437	0.0001 8752
1.21	0.0089 0714	0.0035 2404	0.0013 7513	0.0005 3069	0.0002 0296
1.22	0.0093 2499	0.0037 1946	0.0014 6325	0.0005 6933	0.0002 1953
1.23	0.0097 5839	0.0039 2381	0.0015 5617	0.0006 1040	0.0002 3728
1.24	0.0102 0775	0.0041 3742	0.0016 5409	0.0006 5404	0.0002 5629
1.25	0.0106 7351	0.0043 6062	0.0017 5722	0.0007 0038	0.0002 7665
1.26	0.0111 5608	0.0045 9373	0.0018 6581	0.0007 4955	0.0002 9843
1.27	0.0116 5592	0.0048 3711	0.0019 8008	0.0008 0172	0.0003 2171
1.28	0.0121 7346	0.0050 9110	0.0021 0028	0.0008 5702	0.0003 4659
1.29	0.0127 0917	0.0053 5606	0.0022 2665	0.0009 1562	0.0003 7315
1.30	0.0132 6348	0.0056 3236	0.0023 5946	0.0009 7768	0.0004 0151
1.31	0.0138 3688	0.0059 2038	0.0024 9897	0.0010 4338	0.0004 3176
1.32	0.0144 2983	0.0062 2050	0.0026 4545	0.0011 1289	0.0004 6401
1.33	0.0150 4280	0.0065 3312	0.0027 9919	0.0011 8640	0.0004 9838
1.34	0.0156 7628	0.0068 5864	0.0029 6049	0.0012 6410	0.0005 3498
1.35	0.0163 3075	0.0071 9746	0.0031 2963	0.0013 4619	0.0005 7394
1.36	0.0170 0671	0.0075 5000	0.0033 0694	0.0014 3289	0.0006 1539
1.37	0.0177 0466	0.0079 1671	0.0034 9272	0.0015 2440	0.0006 5946
1.38	0.0184 2511	0.0082 9800	0.0036 8731	0.0016 2095	0.0007 0630
1.39	0.0191 6856	0.0086 9433	0.0038 9105	0.0017 2277	0.0007 5606
1.40	0.0199 3553	0.0091 0616	0.0041 0428	0.0018 3011	0.0008 0890
1.41	0.0207 2655	0.0095 3393	0.0043 2736	0.0019 4321	0.0008 6496
1.42	0.0215 4214	0.0099 7814	0.0045 6065	0.0020 6233	0.0009 2444
1.43	0.0223 8284	0.0104 3926	0.0048 0454	0.0021 8775	0.0009 8749
1.44	0.0232 4918	0.0109 1777	0.0050 5941	0.0023 1972	0.0010 5431
1.45	0.0241 4171	0.0114 1419	0.0053 2565	0.0024 5855	0.0011 2510
1.46	0.0250 6098	0.0119 2902	0.0056 0368	0.0026 0452	0.0012 0004
1.47	0.0260 0754	0.0124 6277	0.0058 9391	0.0027 5795	0.0012 7934
1.48	0.0269 8195	0.0130 1598	0.0061 9677	0.0029 1915	0.0013 6324
1.49	0.0279 8478	0.0135 8918	0.0065 1270	0.0030 8845	0.0014 5194
1.50	0.0290 1659	0.0141 8292	0.0068 4216	0.0032 6619	0.0015 4570

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
1.51	0.0300 7795	0.0147 9775	0.0071 8560	0.0034 5270	0.0016 4474
1.52	0.0311 6945	0.0154 3424	0.0075 4350	0.0036 4837	0.0017 4933
1.53	0.0322 9166	0.0160 9296	0.0079 1635	0.0038 5354	0.0018 5973
1.54	0.0334 4517	0.0167 7448	0.0083 0464	0.0040 6862	0.0019 7621
1.55	0.0346 3057	0.0174 7942	0.0087 0888	0.0042 9399	0.0020 9907
1.56	0.0358 4845	0.0182 0835	0.0091 2959	0.0045 3006	0.0022 2859
1.57	0.0370 9941	0.0189 6190	0.0095 6730	0.0047 7725	0.0023 6509
1.58	0.0383 8405	0.0197 4069	0.0100 2256	0.0050 3599	0.0025 0887
1.59	0.0397 0297	0.0205 4533	0.0104 9592	0.0053 0673	0.0026 6028
1.60	0.0410 5679	0.0213 7647	0.0109 8795	0.0055 8992	0.0028 1965
1.61	0.0424 4610	0.0222 3475	0.0114 9924	0.0058 8605	0.0029 8735
1.62	0.0438 7153	0.0231 2083	0.0120 3038	0.0061 9558	0.0031 6373
1.63	0.0453 3369	0.0240 3537	0.0125 8197	0.0065 1902	0.0033 4917
1.64	0.0468 3320	0.0249 7904	0.0131 5463	0.0068 5689	0.0035 4408
1.65	0.0483 7068	0.0259 5252	0.0137 4900	0.0072 0970	0.0037 4886
1.66	0.0499 4675	0.0269 5651	0.0143 6572	0.0075 7801	0.0039 6393
1.67	0.0515 6203	0.0279 9169	0.0150 0544	0.0079 6237	0.0041 8972
1.68	0.0532 1716	0.0290 5877	0.0156 6884	0.0083 6334	0.0044 2670
1.69	0.0549 1275	0.0301 5847	0.0163 5659	0.0087 8152	0.0046 7531
1.70	0.0566 4944	0.0312 9152	0.0170 6941	0.0092 1750	0.0049 3606
1.71	0.0584 2786	0.0324 5863	0.0178 0798	0.0096 7191	0.0052 0942
1.72	0.0602 4864	0.0336 6054	0.0185 7305	0.0101 4538	0.0054 9592
1.73	0.0621 1241	0.0348 9801	0.0193 6534	0.0106 3855	0.0057 9608
1.74	0.0640 1979	0.0361 7178	0.0201 8559	0.0111 5210	0.0061 1045
1.75	0.0659 7143	0.0374 8261	0.0210 3458	0.0116 8669	0.0064 3960
1.76	0.0679 6796	0.0388 3128	0.0219 1308	0.0122 4304	0.0067 8410
1.77	0.0700 0999	0.0402 1855	0.0228 2188	0.0128 2185	0.0071 4455
1.78	0.0720 9817	0.0416 4520	0.0237 6177	0.0134 2385	0.0075 2157
1.79	0.0742 3313	0.0431 1203	0.0247 3357	0.0140 4980	0.0079 1580
1.80	0.0764 1548	0.0446 1982	0.0257 3810	0.0147 0047	0.0083 2789
1.81	0.0786 4586	0.0461 6939	0.0267 7622	0.0153 7663	0.0087 5851
1.82	0.0809 2489	0.0477 6152	0.0278 4876	0.0160 7908	0.0092 0835
1.83	0.0832 5320	0.0493 9704	0.0289 5660	0.0168 0865	0.0096 7813
1.84	0.0856 3140	0.0510 7675	0.0301 0062	0.0175 6617	0.0101 6858
1.85	0.0880 6010	0.0528 0150	0.0312 8170	0.0183 5249	0.0106 8046
1.86	0.0905 3994	0.0545 7209	0.0325 0075	0.0191 6849	0.0112 1453
1.87	0.0930 7151	0.0563 8936	0.0337 5868	0.0200 1506	0.0117 7160
1.88	0.0956 5541	0.0582 5416	0.0350 5643	0.0208 9311	0.0123 5248
1.89	0.0982 9227	0.0601 6731	0.0363 9493	0.0218 0356	0.0129 5801
1.90	0.1009 8266	0.0621 2966	0.0377 7514	0.0227 4736	0.0135 8904
1.91	0.1037 2719	0.0641 4206	0.0391 9802	0.0237 2547	0.0142 4647
1.92	0.1065 2645	0.0662 0537	0.0406 6455	0.0247 3888	0.0149 3120
1.93	0.1093 8101	0.0683 2042	0.0421 7571	0.0257 8858	0.0156 4416
1.94	0.1122 9146	0.0704 8809	0.0437 3251	0.0268 7560	0.0163 8630
1.95	0.1152 5836	0.0727 0922	0.0453 3595	0.0280 0098	0.0171 5859
1.96	0.1182 8228	0.0749 8468	0.0469 8705	0.0291 6576	0.0179 6204
1.97	0.1213 6378	0.0773 1532	0.0486 8685	0.0303 7103	0.0187 9767
1.98	0.1245 0341	0.0797 0202	0.0504 3638	0.0316 1788	0.0196 6652
1.99	0.1277 0170	0.0821 4562	0.0522 3670	0.0329 0742	0.0205 6967
2.00	0.1309 5920	0.0846 4699	0.0540 8886	0.0342 4077	0.0215 0822

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
2.01	0.1342 7643	0.0872 0700	0.0559 9394	0.0356 1910	0.0224 8328
2.02	0.1376 5390	0.0898 2650	0.0579 5302	0.0370 4356	0.0234 9600
2.03	0.1410 9212	0.0925 0635	0.0599 6718	0.0385 1534	0.0245 4756
2.04	0.1445 9159	0.0952 4741	0.0620 3751	0.0400 3564	0.0256 3915
2.05	0.1481 5280	0.0980 5053	0.0641 6512	0.0416 0568	0.0267 7199
2.06	0.1517 7622	0.1009 1656	0.0663 5113	0.0432 2670	0.0279 4733
2.07	0.1554 6232	0.1038 4636	0.0685 9664	0.0448 9994	0.0291 6645
2.08	0.1592 1155	0.1068 4077	0.0709 0279	0.0466 2669	0.0304 3064
2.09	0.1630 2434	0.1099 0062	0.0732 7069	0.0484 0822	0.0317 4122
2.10	0.1669 0113	0.1130 2676	0.0757 0149	0.0502 4585	0.0330 9956
2.11	0.1708 4234	0.1162 2000	0.0781 9633	0.0521 4089	0.0345 0701
2.12	0.1748 4836	0.1194 8118	0.0807 5634	0.0540 9467	0.0359 6499
2.13	0.1789 1958	0.1228 1111	0.0833 8268	0.0561 0855	0.0374 7492
2.14	0.1830 5638	0.1262 1059	0.0860 7650	0.0581 8389	0.0390 3826
2.15	0.1872 5911	0.1296 8043	0.0888 3894	0.0603 2207	0.0406 5647
2.16	0.1915 2811	0.1332 2141	0.0916 7117	0.0625 2449	0.0423 3107
2.17	0.1958 6370	0.1368 3432	0.0945 7434	0.0647 9255	0.0440 6359
2.18	0.2002 6620	0.1405 1993	0.0975 4961	0.0671 2766	0.0458 5556
2.19	0.2047 3590	0.1442 7900	0.1005 9813	0.0695 3127	0.0477 0858
2.20	0.2092 7307	0.1481 1228	0.1037 2105	0.0720 0481	0.0496 2424
2.21	0.2138 7797	0.1520 2050	0.1069 1954	0.0745 4975	0.0516 0417
2.22	0.2185 5082	0.1560 0438	0.1101 9473	0.0771 6753	0.0536 5001
2.23	0.2232 9185	0.1600 6463	0.1135 4778	0.0798 5965	0.0557 6343
2.24	0.2281 0125	0.1642 0195	0.1169 7983	0.0826 2757	0.0579 4614
2.25	0.2329 7920	0.1684 1701	0.1204 9201	0.0854 7279	0.0601 9985
2.26	0.2379 2585	0.1727 1047	0.1240 8546	0.0883 9682	0.0625 2628
2.27	0.2429 4132	0.1770 8298	0.1277 6129	0.0914 0114	0.0649 2721
2.28	0.2480 2574	0.1815 3517	0.1315 2063	0.0944 8728	0.0674 0441
2.29	0.2531 7918	0.1860 6763	0.1353 6457	0.0976 5674	0.0699 5967
2.30	0.2584 0171	0.1906 8095	0.1392 9421	0.1009 1105	0.0725 9482
2.31	0.2636 9336	0.1953 7569	0.1433 1064	0.1042 5172	0.0753 1168
2.32	0.2690 5414	0.2001 5241	0.1474 1492	0.1076 8027	0.0781 1212
2.33	0.2744 8405	0.2050 1161	0.1516 0811	0.1111 9823	0.0809 9799
2.34	0.2799 8303	0.2099 5380	0.1558 9125	0.1148 0710	0.0839 7117
2.35	0.2855 5102	0.2149 7944	0.1602 6537	0.1185 0842	0.0870 3358
2.36	0.2911 8792	0.2200 8897	0.1647 3147	0.1223 0368	0.0901 8710
2.37	0.2968 9361	0.2252 8282	0.1692 9054	0.1261 9440	0.0934 3367
2.38	0.3026 6793	0.2305 6136	0.1739 4356	0.1301 8208	0.0967 7522
2.39	0.3085 1069	0.2359 2497	0.1786 9145	0.1342 6821	0.1002 1368
2.40	0.3144 2169	0.2413 7396	0.1835 3516	0.1384 5428	0.1037 5100
2.41	0.3204 0067	0.2469 0863	0.1884 7557	0.1427 4174	0.1073 8913
2.42	0.3264 4735	0.2525 2925	0.1935 1357	0.1471 3207	0.1111 3004
2.43	0.3325 6143	0.2582 3605	0.1986 4998	0.1516 2670	0.1149 7568
2.44	0.3387 4254	0.2640 2921	0.2038 8563	0.1562 2706	0.1189 2802
2.45	0.3449 9032	0.2699 0889	0.2092 2130	0.1609 3456	0.1229 8901
2.46	0.3513 0434	0.2758 7522	0.2146 5774	0.1657 5058	0.1271 6061
2.47	0.3576 8415	0.2819 2827	0.2201 9567	0.1706 7648	0.1314 4477
2.48	0.3641 2926	0.2880 6809	0.2258 3576	0.1757 1362	0.1358 4344
2.49	0.3706 3914	0.2942 9466	0.2315 7866	0.1808 6329	0.1403 5856
2.50	0.3772 1323	0.3006 0794	0.2374 2497	0.1861 2679	0.1449 9204

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
2.51	0.3838 5091	0.3070 0785	0.2433 7525	0.1915 0536	0.1497 4580
2.52	0.3905 5154	0.3134 9424	0.2494 3001	0.1970 0022	0.1546 2173
2.53	0.3973 1443	0.3200 6693	0.2555 8972	0.2026 1256	0.1596 2170
2.54	0.4041 3886	0.3267 2569	0.2618 5480	0.2083 4351	0.1647 4757
2.55	0.4110 2404	0.3334 7023	0.2682 2563	0.2141 9417	0.1700 0115
2.56	0.4179 6915	0.3403 0022	0.2747 0252	0.2201 6561	0.1753 8425
2.57	0.4249 7335	0.3472 1526	0.2812 8573	0.2262 5883	0.1808 9863
2.58	0.4320 3571	0.3542 1492	0.2879 7547	0.2324 7479	0.1865 4602
2.59	0.4391 5529	0.3612 9868	0.2947 7189	0.2388 1440	0.1923 2811
2.60	0.4463 3108	0.3684 6599	0.3016 7507	0.2452 7850	0.1982 4655
2.61	0.4535 6203	0.3757 1623	0.3086 8502	0.2518 6788	0.2043 0295
2.62	0.4608 4704	0.3830 4871	0.3158 0171	0.2585 8327	0.2104 9886
2.63	0.4681 8496	0.3904 6269	0.3230 2502	0.2654 2533	0.2168 3578
2.64	0.4755 7459	0.3979 5736	0.3303 5476	0.2723 9465	0.2233 1516
2.65	0.4830 1468	0.4055 3183	0.3377 9066	0.2794 9174	0.2299 3836
2.66	0.4905 0391	0.4131 8517	0.3453 3238	0.2867 1705	0.2367 0672
2.67	0.4980 4093	0.4209 1635	0.3529 7951	0.2940 7093	0.2436 2146
2.68	0.5056 2432	0.4287 2428	0.3607 3153	0.3015 5366	0.2506 8375
2.69	0.5132 5260	0.4366 0780	0.3685 8785	0.3091 6542	0.2578 9467
2.70	0.5209 2425	0.4445 6566	0.3765 4780	0.3169 0629	0.2652 5523
2.71	0.5286 3767	0.4525 9655	0.3846 1060	0.3247 7628	0.2727 6632
2.72	0.5363 9123	0.4606 9906	0.3927 7538	0.3327 7527	0.2804 2876
2.73	0.5441 8320	0.4688 7170	0.4010 4116	0.3409 0305	0.2882 4323
2.74	0.5520 1183	0.4771 1292	0.4094 0689	0.3491 5928	0.2962 1035
2.75	0.5598 7527	0.4854 2106	0.4178 7138	0.3575 4353	0.3043 3057
2.76	0.5677 7163	0.4937 9437	0.4264 3335	0.3660 5523	0.3126 0426
2.77	0.5756 9894	0.5022 3102	0.4350 9140	0.3746 9368	0.3210 3164
2.78	0.5836 5519	0.5107 2908	0.4438 4401	0.3834 5807	0.3296 1280
2.79	0.5916 3828	0.5192 8653	0.4526 8955	0.3923 4742	0.3383 4768
2.80	0.5996 4604	0.5279 0126	0.4616 2627	0.4013 6065	0.3472 3608
2.81	0.6076 7624	0.5365 7103	0.4706 5227	0.4104 9650	0.3562 7763
2.82	0.6157 2658	0.5452 9353	0.4797 6553	0.4197 5356	0.3654 7180
2.83	0.6237 9469	0.5540 6634	0.4889 6392	0.4291 3027	0.3748 1789
2.84	0.6318 7811	0.5628 8691	0.4982 4512	0.4386 2490	0.3843 1502
2.85	0.6399 7433	0.5717 5261	0.5076 0671	0.4482 3554	0.3939 6210
2.86	0.6480 8076	0.5806 6068	0.5170 4611	0.4579 6012	0.4037 5785
2.87	0.6561 9471	0.5896 0825	0.5265 6057	0.4677 9636	0.4137 0079
2.88	0.6643 1344	0.5985 9234	0.5361 4721	0.4777 4181	0.4237 8921
2.89	0.6724 3412	0.6076 0985	0.5458 0297	0.4877 9381	0.4340 2118
2.90	0.6805 5384	0.6166 5753	0.5555 2463	0.4979 4949	0.4443 9452
2.91	0.6886 6960	0.6257 3205	0.5653 0880	0.5082 0578	0.4549 0680
2.92	0.6967 7834	0.6348 2993	0.5751 5191	0.5185 5938	0.4655 5536
2.93	0.7048 7690	0.6439 4755	0.5850 5023	0.5290 0676	0.4763 3722
2.94	0.7129 6203	0.6530 8117	0.5949 9982	0.5395 4416	0.4872 4916
2.95	0.7210 3041	0.6622 2692	0.6049 9657	0.5501 6756	0.4982 8765
2.96	0.7290 7861	0.6713 8078	0.6150 3615	0.5608 7272	0.5094 4885
2.97	0.7371 0313	0.6805 3859	0.6251 1405	0.5716 5510	0.5207 2861
2.98	0.7451 0038	0.6896 9605	0.6352 2556	0.5825 0992	0.5321 2245
2.99	0.7530 6666	0.6988 4872	0.6453 6574	0.5934 3211	0.5436 2554
3.00	0.7609 9820	0.7079 9199	0.6555 2945	0.6044 1632	0.5552 3268

W	P(W,7)	P(W,8)	P(W,9)	P(W,10)	P(W,11)
3.01	0.7688 9110	0.7171 2111	0.6657 1131	0.6154 5688	0.5669 3834
3.02	0.7767 4141	0.7262 3117	0.6759 0572	0.6265 4784	0.5787 3656
3.03	0.7845 4505	0.7353 1712	0.6861 0686	0.6376 8293	0.5906 2101
3.04	0.7922 9785	0.7443 7370	0.6963 0866	0.6488 5554	0.6025 8493
3.05	0.7999 9554	0.7533 9554	0.7065 0480	0.6600 5874	0.6146 2113
3.06	0.8076 3375	0.7623 7706	0.7166 8871	0.6712 8526	0.6267 2197
3.07	0.8152 0801	0.7713 1253	0.7268 5356	0.6825 2744	0.6388 7938
3.08	0.8227 1373	0.7801 9604	0.7369 9227	0.6937 7729	0.6510 8477
3.09	0.8301 4622	0.7890 2149	0.7470 9747	0.7050 2643	0.6633 2906
3.10	0.8375 0070	0.7977 8261	0.7571 6153	0.7162 6608	0.6756 0268
3.11	0.8447 7227	0.8064 7294	0.7671 7652	0.7274 8706	0.6878 9551
3.12	0.8519 5590	0.8150 8583	0.7771 3424	0.7386 7980	0.7001 9689
3.13	0.8590 4648	0.8236 1443	0.7870 2616	0.7498 3428	0.7124 9557
3.14	0.8660 3876	0.8320 5172	0.7968 4348	0.7609 4006	0.7247 7973
3.15	0.8729 2739	0.8403 9045	0.8065 7707	0.7719 8623	0.7370 3693
3.16	0.8797 0689	0.8486 2317	0.8162 1747	0.7829 6144	0.7492 5411
3.17	0.8863 7169	0.8567 4225	0.8257 5493	0.7938 5386	0.7614 1756
3.18	0.8929 1606	0.8647 3981	0.8351 7932	0.8046 5116	0.7735 1288
3.19	0.8993 3418	0.8726 0779	0.8444 8021	0.8153 4052	0.7855 2499
3.20	0.9056 2009	0.8803 3788	0.8536 4678	0.8259 0859	0.7974 3809
3.21	0.9117 6771	0.8879 2156	0.8626 6790	0.8363 4150	0.8092 3564
3.22	0.9177 7083	0.8953 5011	0.8715 3202	0.8466 2484	0.8209 0032
3.23	0.9236 2312	0.9026 1453	0.8802 2727	0.8567 4364	0.8324 1406
3.24	0.9293 1812	0.9097 0561	0.8887 4136	0.8666 8233	0.8437 5792
3.25	0.9348 4923	0.9166 1392	0.8970 6162	0.8764 2479	0.8549 1217
3.26	0.9402 0971	0.9233 2975	0.9051 7499	0.8859 5425	0.8658 5618
3.27	0.9453 9271	0.9298 4316	0.9130 6799	0.8952 5337	0.8765 6845
3.28	0.9503 9122	0.9361 4396	0.9207 2673	0.9043 0412	0.8870 2654
3.29	0.9551 9811	0.9422 2172	0.9281 3690	0.9130 8785	0.8972 0707
3.30	0.9598 0609	0.9480 6570	0.9352 8374	0.9215 8522	0.9070 8568
3.31	0.9642 0774	0.9536 6496	0.9421 5206	0.9297 7622	0.9166 3700
3.32	0.9683 9550	0.9590 0823	0.9487 2621	0.9376 4011	0.9258 3463
3.33	0.9723 6166	0.9640 8402	0.9549 9008	0.9451 5544	0.9346 5109
3.34	0.9760 9834	0.9688 8051	0.9609 2708	0.9523 0002	0.9430 5780
3.35	0.9795 9756	0.9733 8565	0.9665 2016	0.9590 5088	0.9510 2505
3.36	0.9828 5115	0.9775 8706	0.9717 5174	0.9653 8429	0.9585 2196
3.37	0.9858 5080	0.9814 7208	0.9766 0378	0.9712 7571	0.9655 1645
3.38	0.9885 8803	0.9850 2777	0.9810 5768	0.9766 9977	0.9719 7520
3.39	0.9910 5424	0.9882 4087	0.9850 9437	0.9816 3028	0.9778 6363
3.40	0.9932 4063	0.9910 9782	0.9886 9420	0.9860 4017	0.9831 4582
3.41	0.9951 3827	0.9935 8474	0.9918 3700	0.9899 0151	0.9877 8455
3.42	0.9967 3804	0.9956 8744	0.9945 0204	0.9931 8544	0.9917 4117
3.43	0.9980 3069	0.9973 9142	0.9966 6801	0.9958 6219	0.9949 7564
3.44	0.9990 0678	0.9986 8183	0.9983 1304	0.9979 0104	0.9974 4645
3.45	0.9996 5670	0.9995 4350	0.9994 1466	0.9992 7031	0.9991 1057
3.460	0.9999 7068	0.9999 6093	0.9999 4981	0.9999 3731	0.9999 2344
3.461	0.9999 8322	0.9999 7763	0.9999 7126	0.9999 6410	0.9999 5614
3.462	0.9999 9229	0.9999 8972	0.9999 8679	0.9999 8349	0.9999 7983
3.463	0.9999 9788	0.9999 9717	0.9999 9636	0.9999 9546	0.9999 9445
3.464	0.9999 9998	0.9999 9998	0.9999 9997	0.9999 9996	0.9999 9995

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
0.01					
0.02					
0.03					
0.04					
0.05					
0.06					
0.07					
0.08					
0.09					
0.10					
0.11					
0.12					
0.13					
0.14					
0.15					
0.16					
0.17					
0.18					
0.19					
0.20					
0.21					
0.22					
0.23					
0.24					
0.25					
0.26					
0.27					
0.28					
0.29					
0.30					
0.31					
0.32					
0.33					
0.34					
0.35					
0.36					
0.37					
0.38					
0.39					
0.40					
0.41					
0.42					
0.43					
0.44					
0.45					
0.46					
0.47					
0.48					
0.49	0.0000 0000				
0.50	0.0000 0001				

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
0.51	0.0000 0001				
0.52	0.0000 0001				
0.53	0.0000 0001				
0.54	0.0000 0001				
0.55	0.0000 0002				
0.56	0.0000 0002				
0.57	0.0000 0002	0.0000 0000			
0.58	0.0000 0003	0.0000 0001			
0.59	0.0000 0004	0.0000 0001			
0.60	0.0000 0004	0.0000 0001			
0.61	0.0000 0005	0.0000 0001			
0.62	0.0000 0006	0.0000 0001			
0.63	0.0000 0007	0.0000 0001			
0.64	0.0000 0009	0.0000 0002			
0.65	0.0000 0010	0.0000 0002			
0.66	0.0000 0012	0.0000 0002	0.0000 0000		
0.67	0.0000 0014	0.0000 0003	0.0000 0001		
0.68	0.0000 0016	0.0000 0003	0.0000 0001		
0.69	0.0000 0019	0.0000 0004	0.0000 0001		
0.70	0.0000 0022	0.0000 0005	0.0000 0001		
0.71	0.0000 0026	0.0000 0006	0.0000 0001		
0.72	0.0000 0030	0.0000 0007	0.0000 0002		
0.73	0.0000 0035	0.0000 0008	0.0000 0002		
0.74	0.0000 0041	0.0000 0009	0.0000 0002	0.0000 0000	
0.75	0.0000 0047	0.0000 0011	0.0000 0003	0.0000 0001	
0.76	0.0000 0054	0.0000 0013	0.0000 0003	0.0000 0001	
0.77	0.0000 0063	0.0000 0015	0.0000 0004	0.0000 0001	
0.78	0.0000 0072	0.0000 0017	0.0000 0004	0.0000 0001	
0.79	0.0000 0082	0.0000 0020	0.0000 0005	0.0000 0001	
0.80	0.0000 0094	0.0000 0024	0.0000 0006	0.0000 0001	
0.81	0.0000 0108	0.0000 0027	0.0000 0007	0.0000 0002	
0.82	0.0000 0123	0.0000 0031	0.0000 0008	0.0000 0002	0.0000 0000
0.83	0.0000 0140	0.0000 0036	0.0000 0009	0.0000 0002	0.0000 0001
0.84	0.0000 0159	0.0000 0042	0.0000 0011	0.0000 0003	0.0000 0001
0.85	0.0000 0181	0.0000 0048	0.0000 0013	0.0000 0003	0.0000 0001
0.86	0.0000 0205	0.0000 0055	0.0000 0015	0.0000 0004	0.0000 0001
0.87	0.0000 0232	0.0000 0063	0.0000 0017	0.0000 0005	0.0000 0001
0.88	0.0000 0262	0.0000 0072	0.0000 0020	0.0000 0005	0.0000 0001
0.89	0.0000 0295	0.0000 0082	0.0000 0023	0.0000 0006	0.0000 0002
0.90	0.0000 0333	0.0000 0093	0.0000 0026	0.0000 0007	0.0000 0002
0.91	0.0000 0375	0.0000 0106	0.0000 0030	0.0000 0008	0.0000 0002
0.92	0.0000 0421	0.0000 0121	0.0000 0034	0.0000 0010	0.0000 0003
0.93	0.0000 0472	0.0000 0137	0.0000 0040	0.0000 0011	0.0000 0003
0.94	0.0000 0530	0.0000 0155	0.0000 0045	0.0000 0013	0.0000 0004
0.95	0.0000 0593	0.0000 0176	0.0000 0052	0.0000 0015	0.0000 0004
0.96	0.0000 0663	0.0000 0199	0.0000 0059	0.0000 0018	0.0000 0005
0.97	0.0000 0740	0.0000 0224	0.0000 0067	0.0000 0020	0.0000 0006
0.98	0.0000 0826	0.0000 0252	0.0000 0077	0.0000 0023	0.0000 0007
0.99	0.0000 0920	0.0000 0284	0.0000 0087	0.0000 0027	0.0000 0008
1.00	0.0000 1024	0.0000 0319	0.0000 0099	0.0000 0031	0.0000 0009

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
1.01	0.0000 1138	0.0000 0359	0.0000 0112	0.0000 0035	0.0000 0011
1.02	0.0000 1264	0.0000 0402	0.0000 0127	0.0000 0040	0.0000 0013
1.03	0.0000 1402	0.0000 0450	0.0000 0144	0.0000 0046	0.0000 0014
1.04	0.0000 1553	0.0000 0504	0.0000 0163	0.0000 0052	0.0000 0017
1.05	0.0000 1719	0.0000 0563	0.0000 0183	0.0000 0059	0.0000 0019
1.06	0.0000 1901	0.0000 0629	0.0000 0207	0.0000 0068	0.0000 0022
1.07	0.0000 2101	0.0000 0701	0.0000 0233	0.0000 0077	0.0000 0025
1.08	0.0000 2318	0.0000 0781	0.0000 0262	0.0000 0087	0.0000 0029
1.09	0.0000 2556	0.0000 0869	0.0000 0294	0.0000 0099	0.0000 0033
1.10	0.0000 2816	0.0000 0966	0.0000 0329	0.0000 0112	0.0000 0038
1.11	0.0000 3099	0.0000 1073	0.0000 0369	0.0000 0126	0.0000 0043
1.12	0.0000 3407	0.0000 1190	0.0000 0413	0.0000 0143	0.0000 0049
1.13	0.0000 3743	0.0000 1319	0.0000 0462	0.0000 0161	0.0000 0056
1.14	0.0000 4109	0.0000 1460	0.0000 0516	0.0000 0182	0.0000 0064
1.15	0.0000 4506	0.0000 1616	0.0000 0576	0.0000 0204	0.0000 0072
1.16	0.0000 4937	0.0000 1786	0.0000 0642	0.0000 0230	0.0000 0082
1.17	0.0000 5405	0.0000 1972	0.0000 0715	0.0000 0258	0.0000 0093
1.18	0.0000 5913	0.0000 2175	0.0000 0796	0.0000 0290	0.0000 0105
1.19	0.0000 6463	0.0000 2398	0.0000 0885	0.0000 0325	0.0000 0119
1.20	0.0000 7059	0.0000 2641	0.0000 0982	0.0000 0364	0.0000 0134
1.21	0.0000 7704	0.0000 2906	0.0000 1090	0.0000 0407	0.0000 0151
1.22	0.0000 8401	0.0000 3195	0.0000 1208	0.0000 0455	0.0000 0170
1.23	0.0000 9154	0.0000 3509	0.0000 1338	0.0000 0508	0.0000 0192
1.24	0.0000 9968	0.0000 3852	0.0000 1481	0.0000 0566	0.0000 0216
1.25	0.0001 0846	0.0000 4225	0.0000 1637	0.0000 0631	0.0000 0242
1.26	0.0001 1793	0.0000 4631	0.0000 1808	0.0000 0703	0.0000 0272
1.27	0.0001 2813	0.0000 5071	0.0000 1996	0.0000 0782	0.0000 0305
1.28	0.0001 3912	0.0000 5549	0.0000 2201	0.0000 0869	0.0000 0342
1.29	0.0001 5095	0.0000 6067	0.0000 2426	0.0000 0965	0.0000 0382
1.30	0.0001 6367	0.0000 6629	0.0000 2671	0.0000 1071	0.0000 0428
1.31	0.0001 7734	0.0000 7238	0.0000 2938	0.0000 1187	0.0000 0478
1.32	0.0001 9203	0.0000 7898	0.0000 3230	0.0000 1315	0.0000 0533
1.33	0.0002 0781	0.0000 8611	0.0000 3549	0.0000 1456	0.0000 0595
1.34	0.0002 2474	0.0000 9382	0.0000 3895	0.0000 1610	0.0000 0663
1.35	0.0002 4289	0.0001 0215	0.0000 4273	0.0000 1779	0.0000 0738
1.36	0.0002 6234	0.0001 1114	0.0000 4683	0.0000 1964	0.0000 0820
1.37	0.0002 8319	0.0001 2085	0.0000 5129	0.0000 2167	0.0000 0912
1.38	0.0003 0550	0.0001 3131	0.0000 5614	0.0000 2389	0.0000 1012
1.39	0.0003 2937	0.0001 4259	0.0000 6140	0.0000 2632	0.0000 1123
1.40	0.0003 5490	0.0001 5475	0.0000 6711	0.0000 2897	0.0000 1246
1.41	0.0003 8219	0.0001 6783	0.0000 7330	0.0000 3187	0.0000 1380
1.42	0.0004 1135	0.0001 8190	0.0000 8001	0.0000 3503	0.0000 1527
1.43	0.0004 4247	0.0001 9703	0.0000 8727	0.0000 3848	0.0000 1690
1.44	0.0004 7569	0.0002 1330	0.0000 9513	0.0000 4223	0.0000 1867
1.45	0.0005 1112	0.0002 3077	0.0001 0363	0.0000 4633	0.0000 2062
1.46	0.0005 4890	0.0002 4952	0.0001 1282	0.0000 5078	0.0000 2276
1.47	0.0005 8915	0.0002 6963	0.0001 2275	0.0000 5562	0.0000 2510
1.48	0.0006 3201	0.0002 9121	0.0001 3347	0.0000 6089	0.0000 2767
1.49	0.0006 7765	0.0003 1433	0.0001 4503	0.0000 6661	0.0000 3047
1.50	0.0007 2620	0.0003 3909	0.0001 5750	0.0000 7282	0.0000 3353

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
1.51	0.0007 7784	0.0003 6561	0.0001 7094	0.0000 7956	0.0000 3688
1.52	0.0008 3273	0.0003 9398	0.0001 8542	0.0000 8686	0.0000 4053
1.53	0.0008 9105	0.0004 2432	0.0002 0100	0.0000 9478	0.0000 4451
1.54	0.0009 5300	0.0004 5676	0.0002 1777	0.0001 0335	0.0000 4885
1.55	0.0010 1875	0.0004 9142	0.0002 3581	0.0001 1264	0.0000 5359
1.56	0.0010 8852	0.0005 2844	0.0002 5519	0.0001 2268	0.0000 5874
1.57	0.0011 6252	0.0005 6795	0.0002 7602	0.0001 3353	0.0000 6434
1.58	0.0012 4097	0.0006 1010	0.0002 9838	0.0001 4527	0.0000 7044
1.59	0.0013 2411	0.0006 5506	0.0003 2238	0.0001 5794	0.0000 7707
1.60	0.0014 1217	0.0007 0298	0.0003 4812	0.0001 7161	0.0000 8426
1.61	0.0015 0541	0.0007 5403	0.0003 7572	0.0001 8637	0.0000 9208
1.62	0.0016 0408	0.0008 0840	0.0004 0529	0.0002 0228	0.0001 0055
1.63	0.0017 0848	0.0008 6628	0.0004 3697	0.0002 1942	0.0001 0974
1.64	0.0018 1887	0.0009 2786	0.0004 7088	0.0002 3789	0.0001 1971
1.65	0.0019 3557	0.0009 9335	0.0005 0716	0.0002 5777	0.0001 3050
1.66	0.0020 5887	0.0010 6298	0.0005 4597	0.0002 7917	0.0001 4218
1.67	0.0021 8911	0.0011 3696	0.0005 8746	0.0003 0217	0.0001 5482
1.68	0.0023 2661	0.0012 1553	0.0006 3179	0.0003 2691	0.0001 6849
1.69	0.0024 7173	0.0012 9896	0.0006 7913	0.0003 5348	0.0001 8326
1.70	0.0026 2483	0.0013 8750	0.0007 2967	0.0003 8202	0.0001 9922
1.71	0.0027 8630	0.0014 8142	0.0007 8361	0.0004 1265	0.0002 1645
1.72	0.0029 5651	0.0015 8101	0.0008 4113	0.0004 4551	0.0002 3504
1.73	0.0031 3587	0.0016 8657	0.0009 0246	0.0004 8075	0.0002 5510
1.74	0.0033 2482	0.0017 9841	0.0009 6782	0.0005 1852	0.0002 7672
1.75	0.0035 2379	0.0019 1687	0.0010 3743	0.0005 5898	0.0003 0001
1.76	0.0037 3323	0.0020 4227	0.0011 1156	0.0006 0231	0.0003 2510
1.77	0.0039 5362	0.0021 7498	0.0011 9045	0.0006 4869	0.0003 5211
1.78	0.0041 8545	0.0023 1537	0.0012 7437	0.0006 9832	0.0003 8117
1.79	0.0044 2922	0.0024 6383	0.0013 6362	0.0007 5138	0.0004 1242
1.80	0.0046 8547	0.0026 2075	0.0014 5849	0.0008 0810	0.0004 4601
1.81	0.0049 5473	0.0027 8656	0.0015 5929	0.0008 6871	0.0004 8210
1.82	0.0052 3756	0.0029 6170	0.0016 6635	0.0009 3343	0.0005 2086
1.83	0.0055 3456	0.0031 4663	0.0017 8001	0.0010 0253	0.0005 6247
1.84	0.0058 4633	0.0033 4181	0.0019 0064	0.0010 7626	0.0006 0710
1.85	0.0061 7349	0.0035 4774	0.0020 2860	0.0011 5490	0.0006 5497
1.86	0.0065 1669	0.0037 6494	0.0021 6430	0.0012 3875	0.0007 0629
1.87	0.0068 7659	0.0039 9394	0.0023 0814	0.0013 2810	0.0007 6127
1.88	0.0072 5389	0.0042 3529	0.0024 6055	0.0014 2329	0.0008 2015
1.89	0.0076 4930	0.0044 8958	0.0026 2199	0.0015 2466	0.0008 8319
1.90	0.0080 6355	0.0047 5740	0.0027 9292	0.0016 3255	0.0009 5065
1.91	0.0084 9740	0.0050 3937	0.0029 7383	0.0017 4735	0.0010 2280
1.92	0.0089 5164	0.0053 3614	0.0031 6524	0.0018 6944	0.0010 9994
1.93	0.0094 2708	0.0056 4830	0.0033 6767	0.0019 9924	0.0011 8238
1.94	0.0099 2455	0.0059 7679	0.0035 8170	0.0021 3719	0.0012 7044
1.95	0.0104 4490	0.0063 2209	0.0038 0789	0.0022 8373	0.0013 6448
1.96	0.0109 8903	0.0066 8501	0.0040 4685	0.0024 3934	0.0014 6485
1.97	0.0115 5785	0.0070 6634	0.0042 9921	0.0026 0453	0.0015 7193
1.98	0.0121 5229	0.0074 6689	0.0045 6564	0.0027 7980	0.0016 8614
1.99	0.0127 7333	0.0078 8746	0.0048 4681	0.0029 6571	0.0018 0789
2.00	0.0134 2196	0.0083 2894	0.0051 4344	0.0031 6282	0.0019 3763

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
2.01	0.0140 9920	0.0087 9220	0.0054 5627	0.0033 7175	0.0020 7584
2.02	0.0148 0611	0.0092 7817	0.0057 8607	0.0035 9310	0.0022 2299
2.03	0.0155 4377	0.0097 8779	0.0061 3363	0.0038 2754	0.0023 7962
2.04	0.0163 1329	0.0103 2205	0.0064 9980	0.0040 7575	0.0025 4626
2.05	0.0171 1582	0.0108 8196	0.0068 8544	0.0043 3843	0.0027 2349
2.06	0.0179 5253	0.0114 6858	0.0072 9144	0.0046 1634	0.0029 1191
2.07	0.0188 2462	0.0120 8297	0.0077 1874	0.0049 1026	0.0031 1215
2.08	0.0197 3333	0.0127 2627	0.0081 6831	0.0052 2098	0.0033 2487
2.09	0.0206 7993	0.0133 9962	0.0086 4115	0.0055 4937	0.0035 5076
2.10	0.0216 6573	0.0141 0421	0.0091 3829	0.0058 9630	0.0037 9055
2.11	0.0226 9205	0.0148 4127	0.0096 6083	0.0062 6268	0.0040 4500
2.12	0.0237 6027	0.0156 1206	0.0102 0988	0.0066 4948	0.0043 1491
2.13	0.0248 7177	0.0164 1788	0.0107 8660	0.0070 5769	0.0046 0110
2.14	0.0260 2801	0.0172 6008	0.0113 9218	0.0074 8835	0.0049 0445
2.15	0.0272 3044	0.0181 4002	0.0120 2787	0.0079 4254	0.0052 2587
2.16	0.0284 8057	0.0190 5913	0.0126 9495	0.0084 2138	0.0055 6631
2.17	0.0297 7993	0.0200 1887	0.0133 9475	0.0089 2604	0.0059 2678
2.18	0.0311 3010	0.0210 2075	0.0141 2865	0.0094 5774	0.0063 0831
2.19	0.0325 3268	0.0220 6630	0.0148 9806	0.0100 1772	0.0067 1199
2.20	0.0339 8931	0.0231 5711	0.0157 0446	0.0106 0731	0.0071 3896
2.21	0.0355 0166	0.0242 9481	0.0165 4935	0.0112 2785	0.0075 9039
2.22	0.0370 7145	0.0254 8107	0.0174 3430	0.0118 8077	0.0080 6752
2.23	0.0387 0042	0.0267 1762	0.0183 6092	0.0125 6751	0.0085 7165
2.24	0.0403 9035	0.0280 0620	0.0193 3088	0.0132 8961	0.0091 0410
2.25	0.0421 4306	0.0293 4863	0.0203 4589	0.0140 4863	0.0096 6628
2.26	0.0439 6039	0.0307 4675	0.0214 0772	0.0148 4619	0.0102 5965
2.27	0.0458 4422	0.0322 0247	0.0225 1819	0.0156 8399	0.0108 8571
2.28	0.0477 9648	0.0337 1772	0.0236 7918	0.0165 6377	0.0115 4604
2.29	0.0498 1912	0.0352 9450	0.0248 9262	0.0174 8734	0.0122 4229
2.30	0.0519 1411	0.0369 3483	0.0261 6049	0.0184 5656	0.0129 7615
2.31	0.0540 8349	0.0386 4079	0.0274 8485	0.0194 7337	0.0137 4940
2.32	0.0563 2929	0.0404 1453	0.0288 6778	0.0205 3976	0.0145 6387
2.33	0.0586 5360	0.0422 5820	0.0303 1145	0.0216 5780	0.0154 2148
2.34	0.0610 5855	0.0441 7403	0.0318 1808	0.0228 2960	0.0163 2420
2.35	0.0635 4626	0.0461 6428	0.0333 8994	0.0240 5738	0.0172 7408
2.36	0.0661 1892	0.0482 3127	0.0350 2936	0.0253 4340	0.0182 7327
2.37	0.0687 7873	0.0503 7736	0.0367 3875	0.0266 8999	0.0193 2396
2.38	0.0715 2793	0.0526 0494	0.0385 2055	0.0280 9956	0.0204 2844
2.39	0.0743 6877	0.0549 1648	0.0403 7729	0.0295 7459	0.0215 8908
2.40	0.0773 0355	0.0573 1446	0.0423 1154	0.0311 1765	0.0228 0834
2.41	0.0803 3457	0.0598 0142	0.0443 2594	0.0327 3135	0.0240 8874
2.42	0.0834 6417	0.0623 7994	0.0464 2318	0.0344 1841	0.0254 3292
2.43	0.0866 9471	0.0650 5265	0.0486 0604	0.0361 8160	0.0268 4357
2.44	0.0900 2857	0.0678 2221	0.0508 7732	0.0380 2379	0.0283 2350
2.45	0.0934 6815	0.0706 9133	0.0532 3992	0.0399 4791	0.0298 7559
2.46	0.0970 1586	0.0736 6276	0.0556 9676	0.0419 5696	0.0315 0283
2.47	0.1006 7415	0.0767 3927	0.0582 5086	0.0440 5405	0.0332 0829
2.48	0.1044 4545	0.0799 2369	0.0609 0526	0.0462 4234	0.0349 9514
2.49	0.1083 3223	0.0832 1888	0.0636 6310	0.0485 2509	0.0368 6664
2.50	0.1123 3695	0.0866 2773	0.0665 2753	0.0509 0561	0.0388 2616

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
2.51	0.1164 6209	0.0901 5315	0.0695 0180	0.0533 8732	0.0408 7716
2.52	0.1207 1014	0.0937 9811	0.0725 8918	0.0559 7369	0.0430 2320
2.53	0.1250 8358	0.0975 6557	0.0757 9303	0.0586 6830	0.0452 6792
2.54	0.1295 8490	0.1014 5854	0.0791 1671	0.0614 7477	0.0476 1510
2.55	0.1342 1657	0.1054 8005	0.0825 6369	0.0643 9682	0.0500 6858
2.56	0.1389 8107	0.1096 3315	0.0861 3743	0.0674 3825	0.0526 3233
2.57	0.1438 8086	0.1139 2090	0.0898 4149	0.0706 0291	0.0553 1040
2.58	0.1489 1841	0.1183 4638	0.0936 7943	0.0738 9474	0.0581 0694
2.59	0.1540 9614	0.1229 1267	0.0976 5486	0.0773 1774	0.0610 2621
2.60	0.1594 1647	0.1276 2288	0.1017 7146	0.0808 7600	0.0640 7257
2.61	0.1648 8180	0.1324 8009	0.1060 3289	0.0845 7365	0.0672 5047
2.62	0.1704 9448	0.1374 8742	0.1104 4288	0.0884 1489	0.0705 6445
2.63	0.1762 5685	0.1426 4795	0.1150 0518	0.0924 0399	0.0740 1916
2.64	0.1821 7121	0.1479 6477	0.1197 2356	0.0965 4527	0.0776 1932
2.65	0.1882 3979	0.1534 4093	0.1246 0179	0.1008 4311	0.0813 6976
2.66	0.1944 6482	0.1590 7951	0.1296 4369	0.1053 0193	0.0852 7539
2.67	0.2008 4843	0.1648 8350	0.1348 5305	0.1099 2621	0.0893 4119
2.68	0.2073 9272	0.1708 5592	0.1402 3369	0.1147 2044	0.0935 7225
2.69	0.2140 9973	0.1769 9971	0.1457 8941	0.1196 8918	0.0979 7372
2.70	0.2209 7141	0.1833 1779	0.1515 2401	0.1248 3701	0.1025 5080
2.71	0.2280 0964	0.1898 1301	0.1574 4128	0.1301 6852	0.1073 0879
2.72	0.2352 1623	0.1964 8819	0.1635 4497	0.1356 8832	0.1122 5302
2.73	0.2425 9289	0.2033 4606	0.1698 3881	0.1414 0105	0.1173 8891
2.74	0.2501 4123	0.2103 8929	0.1763 2648	0.1473 1132	0.1227 2190
2.75	0.2578 6276	0.2176 2046	0.1830 1163	0.1534 2375	0.1282 5747
2.76	0.2657 5889	0.2250 4208	0.1898 9783	0.1597 4296	0.1340 0115
2.77	0.2738 3088	0.2326 5653	0.1969 8860	0.1662 7351	0.1399 5846
2.78	0.2820 7989	0.2404 6611	0.2042 8737	0.1730 1994	0.1461 3496
2.79	0.2905 0693	0.2484 7299	0.2117 9751	0.1799 8675	0.1525 3621
2.80	0.2991 1286	0.2566 7920	0.2195 2225	0.1871 7836	0.1591 6774
2.81	0.3078 9841	0.2650 8665	0.2274 6473	0.1945 9915	0.1660 3507
2.82	0.3168 6410	0.2736 9708	0.2356 2797	0.2022 5338	0.1731 4369
2.83	0.3260 1031	0.2825 1208	0.2440 1484	0.2101 4524	0.1804 9903
2.84	0.3353 3722	0.2915 3305	0.2526 2806	0.2182 7877	0.1881 0645
2.85	0.3448 4482	0.3007 6122	0.2614 7019	0.2266 5791	0.1959 7124
2.86	0.3545 3287	0.3101 9759	0.2705 4359	0.2352 8644	0.2040 9857
2.87	0.3644 0094	0.3198 4296	0.2798 5043	0.2441 6797	0.2124 9350
2.88	0.3744 4833	0.3296 9789	0.2893 9267	0.2533 0591	0.2211 6095
2.89	0.3846 7413	0.3397 6270	0.2991 7202	0.2627 0350	0.2301 0567
2.90	0.3950 7715	0.3500 3742	0.3091 8994	0.2723 6370	0.2393 3223
2.91	0.4056 5593	0.3605 2182	0.3194 4760	0.2822 8926	0.2488 4497
2.92	0.4164 0873	0.3712 1538	0.3299 4591	0.2924 8263	0.2586 4801
2.93	0.4273 3349	0.3821 1721	0.3406 8541	0.3029 4596	0.2687 4520
2.94	0.4384 2784	0.3932 2614	0.3516 6633	0.3136 8108	0.2791 4008
2.95	0.4496 8910	0.4045 4061	0.3628 8852	0.3246 8945	0.2898 3586
2.96	0.4611 1421	0.4160 5868	0.3743 5145	0.3359 7214	0.3008 3541
2.97	0.4726 9976	0.4277 7801	0.3860 5414	0.3475 2981	0.3121 4115
2.98	0.4844 4194	0.4396 9585	0.3979 9519	0.3593 6266	0.3237 5511
2.99	0.4963 3655	0.4518 0897	0.4101 7271	0.3714 7039	0.3356 7882
3.00	0.5083 7898	0.4641 1371	0.4225 8429	0.3838 5218	0.3479 1326

W	P(W,12)	P(W,13)	P(W,14)	P(W,15)	P(W,16)
3.01	0.5205 6416	0.4766 0588	0.4352 2700	0.3965 0666	0.3604 5890
3.02	0.5328 8656	0.4892 8077	0.4480 9732	0.4094 3182	0.3733 1553
3.03	0.5453 4019	0.5021 3311	0.4611 9112	0.4226 2503	0.3864 8230
3.04	0.5579 1853	0.5151 5708	0.4745 0362	0.4360 8294	0.3999 5765
3.05	0.5706 1456	0.5283 4622	0.4880 2937	0.4498 0147	0.4137 3922
3.06	0.5834 2070	0.5416 9343	0.5017 6218	0.4637 7576	0.4278 2381
3.07	0.5963 2881	0.5551 9095	0.5156 9509	0.4780 0007	0.4422 0732
3.08	0.6093 3013	0.5688 3030	0.5298 2034	0.4924 6779	0.4568 8470
3.09	0.6224 1532	0.5826 0226	0.5441 2930	0.5071 7134	0.4718 4983
3.10	0.6355 7436	0.5964 9684	0.5586 1247	0.5221 0212	0.4870 9550
3.11	0.6487 9658	0.6105 0324	0.5732 5934	0.5372 5047	0.5026 1329
3.12	0.6620 7060	0.6246 0979	0.5880 5846	0.5526 0556	0.5183 9351
3.13	0.6753 8431	0.6388 0394	0.6029 9728	0.5681 5535	0.5344 2513
3.14	0.6887 2485	0.6530 7221	0.6180 6215	0.5838 8652	0.5506 9565
3.15	0.7020 7857	0.6674 0013	0.6332 3826	0.5997 8440	0.5671 9102
3.16	0.7154 3101	0.6817 7222	0.6485 0955	0.6158 3285	0.5838 9557
3.17	0.7287 6685	0.6961 7193	0.6638 5869	0.6320 1422	0.6007 9186
3.18	0.7420 6989	0.7105 8162	0.6792 6697	0.6483 0927	0.6178 6060
3.19	0.7553 2302	0.7249 8244	0.6947 1428	0.6646 9704	0.6350 8052
3.20	0.7685 0818	0.7393 5439	0.7101 7901	0.6811 5479	0.6524 2827
3.21	0.7816 0630	0.7536 7615	0.7256 3797	0.6976 5788	0.6698 7825
3.22	0.7945 9733	0.7679 2511	0.7410 6633	0.7141 7970	0.6874 0252
3.23	0.8074 6011	0.7820 7730	0.7564 3755	0.7306 9152	0.7049 7066
3.24	0.8201 7241	0.7961 0728	0.7717 2329	0.7471 6242	0.7225 4960
3.25	0.8327 1085	0.8099 8815	0.7868 9331	0.7635 5915	0.7401 0346
3.26	0.8450 5088	0.8236 9145	0.8019 1542	0.7798 4602	0.7575 9343
3.27	0.8571 6669	0.8371 8709	0.8167 5533	0.7959 8479	0.7749 7759
3.28	0.8690 3125	0.8504 4334	0.8313 7662	0.8119 3449	0.7922 1070
3.29	0.8806 1617	0.8634 2666	0.8457 4060	0.8276 5134	0.8092 4406
3.30	0.8918 9174	0.8761 0174	0.8598 0624	0.8430 8858	0.8260 2531
3.31	0.9028 2682	0.8884 3136	0.8735 3003	0.8581 9633	0.8424 9821
3.32	0.9133 8881	0.9003 7634	0.8868 6590	0.8729 2145	0.8586 0247
3.33	0.9235 4361	0.9118 9544	0.8997 6509	0.8872 0734	0.8742 7347
3.34	0.9332 5558	0.9229 4533	0.9121 7604	0.9009 9383	0.8894 4211
3.35	0.9424 8743	0.9334 8044	0.9240 4427	0.9142 1696	0.9040 3451
3.36	0.9512 0025	0.9434 5295	0.9353 1227	0.9268 0884	0.9179 7181
3.37	0.9593 5336	0.9528 1263	0.9459 1933	0.9386 9743	0.9311 6987
3.38	0.9669 0435	0.9615 0682	0.9558 0145	0.9498 0638	0.9435 3903
3.39	0.9738 0894	0.9694 8026	0.9648 9117	0.9600 5480	0.9549 8381
3.40	0.9800 2095	0.9766 7508	0.9731 1746	0.9693 5707	0.9654 0264
3.41	0.9854 9226	0.9830 3063	0.9804 0552	0.9776 2263	0.9746 8753
3.42	0.9901 7270	0.9884 8343	0.9866 7669	0.9847 5573	0.9827 2377
3.43	0.9940 1005	0.9929 6704	0.9918 4823	0.9906 5523	0.9893 8959
3.44	0.9969 4988	0.9964 1193	0.9958 3321	0.9952 1431	0.9945 5582
3.45	0.9989 3557	0.9987 4544	0.9985 4031	0.9983 2029	0.9980 8552
3.460	0.9999 0820	0.9998 9159	0.9998 7363	0.9998 5430	0.9998 3362
3.461	0.9999 4740	0.9999 3788	0.9999 2757	0.9999 1648	0.9999 0460
3.462	0.9999 7581	0.9999 7142	0.9999 6667	0.9999 6156	0.9999 5608
3.463	0.9999 9334	0.9999 9213	0.9999 9082	0.9999 8941	0.9999 8790
3.464	0.9999 9994	0.9999 9993	0.9999 9992	0.9999 9991	0.9999 9990

W	P(W,17)	P(W,18)	P(W,19)	P(W,20)	P(W,22)
0.51					
0.52					
0.53					
0.54					
0.55					
0.56					
0.57					
0.58					
0.59					
0.60					
0.61					
0.62					
0.63					
0.64					
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0.67					
0.68					
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0.77					
0.78					
0.79					
0.80					
0.81					
0.82					
0.83					
0.84					
0.85					
0.86					
0.87					
0.88					
0.89	0.0000 0000				
0.90	0.0000 0001				
0.91	0.0000 0001				
0.92	0.0000 0001				
0.93	0.0000 0001				
0.94	0.0000 0001				
0.95	0.0000 0001				
0.96	0.0000 0002	0.0000 0000			
0.97	0.0000 0002	0.0000 0001			
0.98	0.0000 0002	0.0000 0001			
0.99	0.0000 0002	0.0000 0001			
1.00	0.0000 0003	0.0000 0001			

W	P(W,17)	P(W,18)	P(W,19)	P(W,20)	P(W,22)
1.01	0.0000 0003	0.0000 0001			
1.02	0.0000 0004	0.0000 0001			
1.03	0.0000 0005	0.0000 0001	0.0000 0000		
1.04	0.0000 0005	0.0000 0002	0.0000 0001		
1.05	0.0000 0006	0.0000 0002	0.0000 0001		
1.06	0.0000 0007	0.0000 0002	0.0000 0001		
1.07	0.0000 0008	0.0000 0003	0.0000 0001		
1.08	0.0000 0010	0.0000 0003	0.0000 0001		
1.09	0.0000 0011	0.0000 0004	0.0000 0001		
1.10	0.0000 0013	0.0000 0004	0.0000 0001	0.0000 0000	
1.11	0.0000 0015	0.0000 0005	0.0000 0002	0.0000 0001	
1.12	0.0000 0017	0.0000 0006	0.0000 0002	0.0000 0001	
1.13	0.0000 0019	0.0000 0007	0.0000 0002	0.0000 0001	
1.14	0.0000 0022	0.0000 0008	0.0000 0003	0.0000 0001	
1.15	0.0000 0025	0.0000 0009	0.0000 0003	0.0000 0001	
1.16	0.0000 0029	0.0000 0010	0.0000 0004	0.0000 0001	
1.17	0.0000 0033	0.0000 0012	0.0000 0004	0.0000 0001	
1.18	0.0000 0038	0.0000 0014	0.0000 0005	0.0000 0002	
1.19	0.0000 0043	0.0000 0016	0.0000 0006	0.0000 0002	
1.20	0.0000 0049	0.0000 0018	0.0000 0007	0.0000 0002	
1.21	0.0000 0056	0.0000 0021	0.0000 0008	0.0000 0003	
1.22	0.0000 0064	0.0000 0024	0.0000 0009	0.0000 0003	0.0000 0000
1.23	0.0000 0072	0.0000 0027	0.0000 0010	0.0000 0004	0.0000 0001
1.24	0.0000 0082	0.0000 0031	0.0000 0012	0.0000 0004	0.0000 0001
1.25	0.0000 0093	0.0000 0035	0.0000 0013	0.0000 0005	0.0000 0001
1.26	0.0000 0105	0.0000 0040	0.0000 0015	0.0000 0006	0.0000 0001
1.27	0.0000 0119	0.0000 0046	0.0000 0018	0.0000 0007	0.0000 0001
1.28	0.0000 0134	0.0000 0052	0.0000 0020	0.0000 0008	0.0000 0001
1.29	0.0000 0151	0.0000 0059	0.0000 0023	0.0000 0009	0.0000 0001
1.30	0.0000 0170	0.0000 0067	0.0000 0027	0.0000 0011	0.0000 0002
1.31	0.0000 0192	0.0000 0077	0.0000 0030	0.0000 0012	0.0000 0002
1.32	0.0000 0215	0.0000 0087	0.0000 0035	0.0000 0014	0.0000 0002
1.33	0.0000 0242	0.0000 0098	0.0000 0040	0.0000 0016	0.0000 0003
1.34	0.0000 0272	0.0000 0111	0.0000 0045	0.0000 0018	0.0000 0003
1.35	0.0000 0305	0.0000 0125	0.0000 0052	0.0000 0021	0.0000 0004
1.36	0.0000 0341	0.0000 0142	0.0000 0059	0.0000 0024	0.0000 0004
1.37	0.0000 0382	0.0000 0160	0.0000 0067	0.0000 0028	0.0000 0005
1.38	0.0000 0428	0.0000 0180	0.0000 0076	0.0000 0032	0.0000 0005
1.39	0.0000 0478	0.0000 0203	0.0000 0086	0.0000 0036	0.0000 0006
1.40	0.0000 0534	0.0000 0228	0.0000 0097	0.0000 0041	0.0000 0007
1.41	0.0000 0595	0.0000 0256	0.0000 0110	0.0000 0047	0.0000 0009
1.42	0.0000 0664	0.0000 0287	0.0000 0124	0.0000 0053	0.0000 0010
1.43	0.0000 0739	0.0000 0322	0.0000 0140	0.0000 0061	0.0000 0011
1.44	0.0000 0823	0.0000 0361	0.0000 0158	0.0000 0069	0.0000 0013
1.45	0.0000 0915	0.0000 0405	0.0000 0178	0.0000 0078	0.0000 0015
1.46	0.0000 1017	0.0000 0453	0.0000 0201	0.0000 0089	0.0000 0017
1.47	0.0000 1129	0.0000 0506	0.0000 0226	0.0000 0101	0.0000 0020
1.48	0.0000 1253	0.0000 0565	0.0000 0254	0.0000 0114	0.0000 0023
1.49	0.0000 1389	0.0000 0631	0.0000 0286	0.0000 0129	0.0000 0026
1.50	0.0000 1539	0.0000 0704	0.0000 0321	0.0000 0146	0.0000 0030

W	P(W,17)	P(W,18)	P(W,19)	P(W,20)	P(W,22)
1.51	0.0000 1703	0.0000 0784	0.0000 0360	0.0000 0165	0.0000 0034
1.52	0.0000 1884	0.0000 0873	0.0000 0404	0.0000 0186	0.0000 0039
1.53	0.0000 2083	0.0000 0972	0.0000 0452	0.0000 0210	0.0000 0045
1.54	0.0000 2301	0.0000 1080	0.0000 0506	0.0000 0236	0.0000 0051
1.55	0.0000 2540	0.0000 1200	0.0000 0566	0.0000 0266	0.0000 0058
1.56	0.0000 2802	0.0000 1333	0.0000 0632	0.0000 0299	0.0000 0066
1.57	0.0000 3089	0.0000 1479	0.0000 0706	0.0000 0336	0.0000 0076
1.58	0.0000 3404	0.0000 1639	0.0000 0787	0.0000 0377	0.0000 0086
1.59	0.0000 3747	0.0000 1816	0.0000 0878	0.0000 0423	0.0000 0098
1.60	0.0000 4123	0.0000 2011	0.0000 0978	0.0000 0474	0.0000 0111
1.61	0.0000 4533	0.0000 2225	0.0000 1089	0.0000 0531	0.0000 0126
1.62	0.0000 4981	0.0000 2460	0.0000 1211	0.0000 0595	0.0000 0143
1.63	0.0000 5470	0.0000 2718	0.0000 1346	0.0000 0665	0.0000 0161
1.64	0.0000 6003	0.0000 3001	0.0000 1496	0.0000 0744	0.0000 0183
1.65	0.0000 6583	0.0000 3311	0.0000 1660	0.0000 0831	0.0000 0206
1.66	0.0000 7216	0.0000 3651	0.0000 1842	0.0000 0927	0.0000 0233
1.67	0.0000 7904	0.0000 4023	0.0000 2042	0.0000 1034	0.0000 0263
1.68	0.0000 8653	0.0000 4431	0.0000 2262	0.0000 1152	0.0000 0297
1.69	0.0000 9468	0.0000 4876	0.0000 2504	0.0000 1283	0.0000 0335
1.70	0.0001 0353	0.0000 5363	0.0000 2771	0.0000 1428	0.0000 0377
1.71	0.0001 1314	0.0000 5896	0.0000 3064	0.0000 1588	0.0000 0424
1.72	0.0001 2357	0.0000 6477	0.0000 3385	0.0000 1765	0.0000 0477
1.73	0.0001 3489	0.0000 7111	0.0000 3738	0.0000 1960	0.0000 0535
1.74	0.0001 4717	0.0000 7802	0.0000 4125	0.0000 2176	0.0000 0601
1.75	0.0001 6047	0.0000 8556	0.0000 4550	0.0000 2413	0.0000 0674
1.76	0.0001 7487	0.0000 9377	0.0000 5015	0.0000 2675	0.0000 0756
1.77	0.0001 9047	0.0001 0271	0.0000 5524	0.0000 2963	0.0000 0847
1.78	0.0002 0734	0.0001 1244	0.0000 6081	0.0000 3280	0.0000 0948
1.79	0.0002 2559	0.0001 2302	0.0000 6690	0.0000 3629	0.0000 1061
1.80	0.0002 4532	0.0001 3452	0.0000 7356	0.0000 4013	0.0000 1186
1.81	0.0002 6664	0.0001 4702	0.0000 8084	0.0000 4434	0.0000 1325
1.82	0.0002 8965	0.0001 6058	0.0000 8878	0.0000 4897	0.0000 1480
1.83	0.0003 1449	0.0001 7531	0.0000 9745	0.0000 5404	0.0000 1651
1.84	0.0003 4129	0.0001 9128	0.0001 0691	0.0000 5961	0.0000 1841
1.85	0.0003 7019	0.0002 0859	0.0001 1722	0.0000 6571	0.0000 2051
1.86	0.0004 0133	0.0002 2736	0.0001 2845	0.0000 7239	0.0000 2284
1.87	0.0004 3488	0.0002 4768	0.0001 4067	0.0000 7970	0.0000 2542
1.88	0.0004 7100	0.0002 6967	0.0001 5398	0.0000 8771	0.0000 2827
1.89	0.0005 0988	0.0002 9347	0.0001 6846	0.0000 9646	0.0000 3142
1.90	0.0005 5170	0.0003 1921	0.0001 8419	0.0001 0603	0.0000 3490
1.91	0.0005 9667	0.0003 4703	0.0002 0129	0.0001 1647	0.0000 3875
1.92	0.0006 4500	0.0003 7709	0.0002 1987	0.0001 2788	0.0000 4298
1.93	0.0006 9692	0.0004 0955	0.0002 4003	0.0001 4033	0.0000 4766
1.94	0.0007 5268	0.0004 4459	0.0002 6190	0.0001 5391	0.0000 5281
1.95	0.0008 1252	0.0004 8239	0.0002 8562	0.0001 6871	0.0000 5848
1.96	0.0008 7672	0.0005 2315	0.0003 1133	0.0001 8483	0.0000 6473
1.97	0.0009 4556	0.0005 6709	0.0003 3919	0.0002 0239	0.0000 7159
1.98	0.0010 1936	0.0006 1442	0.0003 6935	0.0002 2150	0.0000 7915
1.99	0.0010 9843	0.0006 6539	0.0004 0200	0.0002 4228	0.0000 8745
2.00	0.0011 8311	0.0007 2026	0.0004 3732	0.0002 6488	0.0000 9656

W	P(W,17)	P(W,18)	P(W,19)	P(W,20)	P(W,22)
2.01	0.0012 7377	0.0007 7929	0.0004 7551	0.0002 8944	0.0001 0656
2.02	0.0013 7078	0.0008 4278	0.0005 1678	0.0003 1612	0.0001 1754
2.03	0.0014 7455	0.0009 1103	0.0005 6137	0.0003 4508	0.0001 2957
2.04	0.0015 8550	0.0009 8435	0.0006 0951	0.0003 7651	0.0001 4276
2.05	0.0017 0408	0.0010 6311	0.0006 6148	0.0004 1059	0.0001 5720
2.06	0.0018 3077	0.0011 4766	0.0007 1754	0.0004 4755	0.0001 7301
2.07	0.0019 6605	0.0012 3838	0.0007 7798	0.0004 8758	0.0001 9031
2.08	0.0021 1046	0.0013 3570	0.0008 4314	0.0005 3095	0.0002 0923
2.09	0.0022 6456	0.0014 4005	0.0009 1333	0.0005 7789	0.0002 2991
2.10	0.0024 2891	0.0015 5187	0.0009 8892	0.0006 2869	0.0002 5250
2.11	0.0026 0415	0.0016 7167	0.0010 7028	0.0006 8363	0.0002 7716
2.12	0.0027 9092	0.0017 9996	0.0011 5783	0.0007 4301	0.0003 0408
2.13	0.0029 8989	0.0019 3727	0.0012 5197	0.0008 0719	0.0003 3344
2.14	0.0032 0178	0.0020 8420	0.0013 5318	0.0008 7650	0.0003 6545
2.15	0.0034 2735	0.0022 4133	0.0014 6193	0.0009 5132	0.0004 0033
2.16	0.0036 6739	0.0024 0933	0.0015 7874	0.0010 3206	0.0004 3832
2.17	0.0039 2272	0.0025 8886	0.0017 0414	0.0011 1915	0.0004 7968
2.18	0.0041 9421	0.0027 8063	0.0018 3872	0.0012 1304	0.0005 2468
2.19	0.0044 8279	0.0029 8541	0.0019 8309	0.0013 1422	0.0005 7363
2.20	0.0047 8941	0.0032 0399	0.0021 3789	0.0014 2320	0.0006 2683
2.21	0.0051 1508	0.0034 3721	0.0023 0380	0.0015 4055	0.0006 8464
2.22	0.0054 6085	0.0036 8594	0.0024 8156	0.0016 6685	0.0007 4742
2.23	0.0058 2784	0.0039 5112	0.0026 7193	0.0018 0271	0.0008 1557
2.24	0.0062 1718	0.0042 3373	0.0028 7573	0.0019 4881	0.0008 8952
2.25	0.0066 3010	0.0045 3479	0.0030 9380	0.0021 0584	0.0009 6971
2.26	0.0070 6787	0.0048 5539	0.0033 2705	0.0022 7456	0.0010 5663
2.27	0.0075 3181	0.0051 9667	0.0035 7645	0.0024 5575	0.0011 5082
2.28	0.0080 2331	0.0055 5981	0.0038 4300	0.0026 5026	0.0012 5282
2.29	0.0085 4381	0.0059 4607	0.0041 2777	0.0028 5898	0.0013 6323
2.30	0.0090 9484	0.0063 5677	0.0044 3188	0.0030 8284	0.0014 8270
2.31	0.0096 7797	0.0067 9329	0.0047 5652	0.0033 2286	0.0016 1191
2.32	0.0102 9485	0.0072 5708	0.0051 0294	0.0035 8010	0.0017 5159
2.33	0.0109 4721	0.0077 4967	0.0054 7245	0.0038 5566	0.0019 0252
2.34	0.0116 3684	0.0082 7263	0.0058 6643	0.0041 5075	0.0020 6553
2.35	0.0123 6560	0.0088 2764	0.0062 8635	0.0044 6660	0.0022 4151
2.36	0.0131 3546	0.0094 1645	0.0067 3374	0.0048 0455	0.0024 3142
2.37	0.0139 4844	0.0100 4087	0.0072 1021	0.0051 6600	0.0026 3625
2.38	0.0148 0666	0.0107 0283	0.0077 1746	0.0055 5242	0.0028 5709
2.39	0.0157 1231	0.0114 0432	0.0082 5726	0.0059 6537	0.0030 9509
2.40	0.0166 6769	0.0121 4743	0.0088 3148	0.0064 0649	0.0033 5146
2.41	0.0176 7517	0.0129 3433	0.0094 4208	0.0068 7752	0.0036 2751
2.42	0.0187 3723	0.0137 6731	0.0100 9112	0.0073 8029	0.0039 2460
2.43	0.0198 5642	0.0146 4874	0.0107 8076	0.0079 1671	0.0042 4422
2.44	0.0210 3542	0.0155 8109	0.0115 1325	0.0084 8882	0.0045 8791
2.45	0.0222 7699	0.0165 6696	0.0122 9097	0.0090 9874	0.0049 5734
2.46	0.0235 8399	0.0176 0903	0.0131 1638	0.0097 4872	0.0053 5426
2.47	0.0249 5940	0.0187 1011	0.0139 9209	0.0104 4111	0.0057 8052
2.48	0.0264 0630	0.0198 7312	0.0149 2079	0.0111 7838	0.0062 3811
2.49	0.0279 2786	0.0211 0109	0.0159 0534	0.0119 6314	0.0067 2912
2.50	0.0295 2740	0.0223 9717	0.0169 4868	0.0127 9812	0.0072 5575

W	P(W,17)	P(W,18)	P(W,19)	P(W,20)	P(W,22)
2.51	0.0312 0832	0.0237 6466	0.0180 5391	0.0136 8616	0.0078 2036
2.52	0.0329 7415	0.0252 0696	0.0192 2426	0.0146 3029	0.0084 2542
2.53	0.0348 2853	0.0267 2761	0.0204 6309	0.0156 3363	0.0090 7355
2.54	0.0367 7522	0.0283 3028	0.0217 7391	0.0166 9948	0.0097 6754
2.55	0.0388 1810	0.0300 1878	0.0231 6038	0.0178 3128	0.0105 1029
2.56	0.0409 6119	0.0317 9705	0.0246 2630	0.0190 3265	0.0113 0489
2.57	0.0432 0860	0.0336 6919	0.0261 7564	0.0203 0735	0.0121 5462
2.58	0.0455 6458	0.0356 3942	0.0278 1252	0.0216 5933	0.0130 6289
2.59	0.0480 3351	0.0377 1212	0.0295 4121	0.0230 9268	0.0140 3333
2.60	0.0506 1988	0.0398 9183	0.0313 6618	0.0246 1172	0.0150 6975
2.61	0.0533 2833	0.0421 8321	0.0332 9205	0.0262 2091	0.0161 7616
2.62	0.0561 6360	0.0445 9108	0.0353 2359	0.0279 2492	0.0173 5678
2.63	0.0591 3057	0.0471 2044	0.0374 6580	0.0297 2862	0.0186 1604
2.64	0.0622 3424	0.0497 7642	0.0397 2380	0.0316 3707	0.0199 5860
2.65	0.0654 7973	0.0525 6430	0.0421 0295	0.0336 5553	0.0213 8936
2.66	0.0688 7229	0.0554 8953	0.0446 0874	0.0357 8947	0.0229 1343
2.67	0.0724 1729	0.0585 5771	0.0472 4689	0.0380 4460	0.0245 3620
2.68	0.0761 2022	0.0617 7461	0.0500 2328	0.0404 2680	0.0262 6331
2.69	0.0799 8668	0.0651 4613	0.0529 4401	0.0429 4221	0.0281 0064
2.70	0.0840 2239	0.0686 7833	0.0560 1533	0.0455 9716	0.0300 5439
2.71	0.0882 3317	0.0723 7745	0.0592 4371	0.0483 9825	0.0321 3098
2.72	0.0926 2496	0.0762 4983	0.0626 3581	0.0513 5226	0.0343 3718
2.73	0.0972 0379	0.0803 0201	0.0661 9847	0.0544 6623	0.0366 8000
2.74	0.1019 7578	0.0845 4063	0.0699 3873	0.0577 4743	0.0391 6678
2.75	0.1069 4716	0.0889 7249	0.0738 6381	0.0612 0335	0.0418 0518
2.76	0.1121 2422	0.0936 0453	0.0779 8112	0.0648 4173	0.0446 0315
2.77	0.1175 1333	0.0984 4380	0.0822 9825	0.0686 7053	0.0475 6896
2.78	0.1231 2094	0.1034 9747	0.0868 2295	0.0726 9794	0.0507 1122
2.79	0.1289 5353	0.1087 7285	0.0915 6317	0.0769 3239	0.0540 3887
2.80	0.1350 1764	0.1142 7732	0.0965 2700	0.0813 8251	0.0575 6117
2.81	0.1413 1984	0.1200 1839	0.1017 2271	0.0860 5717	0.0612 8771
2.82	0.1478 6674	0.1260 0361	0.1071 5869	0.0909 6545	0.0652 2844
2.83	0.1546 6491	0.1322 4064	0.1128 4350	0.0961 1663	0.0693 9361
2.84	0.1617 2097	0.1387 3717	0.1187 8579	0.1015 2018	0.0737 9384
2.85	0.1690 4146	0.1455 0095	0.1249 9434	0.1071 8577	0.0784 4006
2.86	0.1766 3292	0.1525 3973	0.1314 7804	0.1131 2324	0.0833 4352
2.87	0.1845 0180	0.1598 6130	0.1382 4584	0.1193 4258	0.0885 1581
2.88	0.1926 5448	0.1674 7340	0.1453 0676	0.1258 5393	0.0939 6882
2.89	0.2010 9722	0.1753 8374	0.1526 6985	0.1326 6756	0.0997 1473
2.90	0.2098 3616	0.1836 0000	0.1603 4420	0.1397 9382	0.1057 6601
2.91	0.2188 7729	0.1921 2972	0.1683 3885	0.1472 4316	0.1121 3541
2.92	0.2282 2640	0.2009 8036	0.1766 6285	0.1550 2608	0.1188 3592
2.93	0.2378 8907	0.2101 5923	0.1853 2515	0.1631 5309	0.1258 8076
2.94	0.2478 7062	0.2196 7342	0.1943 3461	0.1716 3470	0.1332 8333
2.95	0.2581 7611	0.2295 2985	0.2036 9994	0.1804 8138	0.1410 5722
2.96	0.2688 1025	0.2397 3515	0.2134 2969	0.1897 0349	0.1492 1615
2.97	0.2797 7741	0.2502 9565	0.2235 3216	0.1993 1128	0.1577 7392
2.98	0.2910 8156	0.2612 1735	0.2340 1539	0.2093 1482	0.1667 4438
2.99	0.3027 2619	0.2725 0583	0.2448 8710	0.2197 2392	0.1761 4138
3.00	0.3147 1431	0.2841 6623	0.2561 5462	0.2305 4814	0.1859 7870

W	P(W,17)	P(W,18)	P(W,19)	P(W,20)	P(W,22)
3.01	0.3270 4840	0.2962 0319	0.2678 2484	0.2417 9664	0.1962 7000
3.02	0.3397 3030	0.3086 2077	0.2799 0414	0.2534 7818	0.2070 2874
3.03	0.3527 6121	0.3214 2240	0.2923 9834	0.2656 0102	0.2182 6810
3.04	0.3661 4159	0.3346 1080	0.3053 1256	0.2781 7283	0.2300 0089
3.05	0.3798 7112	0.3481 8792	0.3186 5123	0.2912 0062	0.2422 3947
3.06	0.3939 4860	0.3621 5485	0.3324 1793	0.3046 9060	0.2549 9562
3.07	0.4083 7191	0.3765 1174	0.3466 1530	0.3186 4814	0.2682 8043
3.08	0.4231 3792	0.3912 5769	0.3612 4498	0.3330 7761	0.2821 0418
3.09	0.4382 4237	0.4063 9067	0.3763 0748	0.3479 8228	0.2964 7619
3.10	0.4536 7984	0.4219 0744	0.3918 0202	0.3633 6417	0.3114 0468
3.11	0.4694 4363	0.4378 0339	0.4077 2649	0.3792 2392	0.3268 9656
3.12	0.4855 2563	0.4540 7244	0.4240 7721	0.3955 6065	0.3429 5729
3.13	0.5019 1628	0.4707 0696	0.4408 4891	0.4123 7177	0.3595 9068
3.14	0.5186 0440	0.4876 9757	0.4580 3444	0.4296 5282	0.3767 9862
3.15	0.5355 7712	0.5050 3305	0.4756 2472	0.4473 9728	0.3945 8091
3.16	0.5528 1971	0.5227 0016	0.4936 0850	0.4655 9638	0.4129 3495
3.17	0.5703 1550	0.5406 8351	0.5119 7221	0.4842 3884	0.4318 5549
3.18	0.5880 4568	0.5589 6537	0.5306 9972	0.5033 1068	0.4513 3431
3.19	0.6059 8924	0.5775 2551	0.5497 7216	0.5227 9497	0.4713 5992
3.20	0.6241 2274	0.5963 4100	0.5691 6770	0.5426 7154	0.4919 1717
3.21	0.6424 2019	0.6153 8602	0.5888 6129	0.5629 1671	0.5129 8689
3.22	0.6608 5287	0.6346 3165	0.6088 2440	0.5835 0297	0.5345 4549
3.23	0.6793 8916	0.6540 4564	0.6290 2478	0.6043 9869	0.5565 6448
3.24	0.6979 9434	0.6735 9220	0.6494 2614	0.6255 6774	0.5790 1003
3.25	0.7166 3040	0.6932 3172	0.6699 8789	0.6469 6915	0.6018 4242
3.26	0.7352 5585	0.7129 2053	0.6906 6475	0.6685 5668	0.6250 1551
3.27	0.7538 2547	0.7326 1061	0.7114 0647	0.6902 7844	0.6484 7616
3.28	0.7722 9011	0.7522 4934	0.7321 5743	0.7120 7642	0.6721 6352
3.29	0.7905 9644	0.7717 7912	0.7528 5628	0.7338 8603	0.6960 0845
3.30	0.8086 8670	0.7911 3714	0.7734 3550	0.7556 3559	0.7199 3267
3.31	0.8264 9845	0.8102 5493	0.7938 2102	0.7772 4580	0.7438 4806
3.32	0.8439 6424	0.8290 5812	0.8139 3171	0.7986 2914	0.7676 5575
3.33	0.8610 1141	0.8474 6596	0.8336 7893	0.8196 8933	0.7912 4527
3.34	0.8775 6170	0.8653 9099	0.8529 6601	0.8403 2062	0.8144 9353
3.35	0.8935 3099	0.8827 3858	0.8716 8772	0.8604 0715	0.8372 6380
3.36	0.9088 2892	0.8994 0653	0.8897 2970	0.8798 2222	0.8594 0459
3.37	0.9233 5859	0.9152 8456	0.9069 6782	0.8984 2752	0.8807 4850
3.38	0.9370 1616	0.9302 5387	0.9232 6764	0.9160 7231	0.9011 1091
3.39	0.9496 9046	0.9441 8659	0.9384 8363	0.9325 9260	0.9202 8861
3.40	0.9612 6263	0.9569 4527	0.9524 5854	0.9478 1018	0.9380 5844
3.41	0.9716 0565	0.9683 8230	0.9650 2263	0.9615 3171	0.9541 7563
3.42	0.9805 8394	0.9783 3931	0.9759 9290	0.9735 4767	0.9683 7226
3.43	0.9880 5287	0.9866 4658	0.9851 7223	0.9836 3130	0.9803 5545
3.44	0.9938 5831	0.9931 2237	0.9923 4855	0.9915 3743	0.9898 0549
3.45	0.9978 3611	0.9975 7220	0.9972 9390	0.9970 0134	0.9963 7389
3.460	0.9998 1158	0.9997 8819	0.9997 6346	0.9997 3739	0.9996 8122
3.461	0.9998 9194	0.9998 7851	0.9998 6430	0.9998 4931	0.9998 1701
3.462	0.9999 5025	0.9999 4405	0.9999 3749	0.9999 3057	0.9999 1566
3.463	0.9999 8629	0.9999 8458	0.9999 8277	0.9999 8086	0.9999 7674
3.464	0.9999 9988	0.9999 9987	0.9999 9985	0.9999 9984	0.9999 9980

W	P(W,24)	P(W,26)	P(W,28)	P(W,30)	P(W,32)
1.01					
1.02					
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1.26					
1.27					
1.28					
1.29					
1.30					
1.31					
1.32					
1.33					
1.34	0.0000 0000				
1.35	0.0000 0001				
1.36	0.0000 0001				
1.37	0.0000 0001				
1.38	0.0000 0001				
1.39	0.0000 0001				
1.40	0.0000 0001				
1.41	0.0000 0002				
1.42	0.0000 0002				
1.43	0.0000 0002				
1.44	0.0000 0002	0.0000 0000			
1.45	0.0000 0003	0.0000 0001			
1.46	0.0000 0003	0.0000 0001			
1.47	0.0000 0004	0.0000 0001			
1.48	0.0000 0005	0.0000 0001			
1.49	0.0000 0005	0.0000 0001			
1.50	0.0000 0006	0.0000 0001			

W	P(W,24)	P(W,26)	P(W,28)	P(W,30)	P(W,32)
1.51	0.0000 0007	0.0000 0001			
1.52	0.0000 0008	0.0000 0002			
1.53	0.0000 0010	0.0000 0002			
1.54	0.0000 0011	0.0000 0002	0.0000 0000		
1.55	0.0000 0013	0.0000 0003	0.0000 0001		
1.56	0.0000 0015	0.0000 0003	0.0000 0001		
1.57	0.0000 0017	0.0000 0004	0.0000 0001		
1.58	0.0000 0019	0.0000 0004	0.0000 0001		
1.59	0.0000 0022	0.0000 0005	0.0000 0001		
1.60	0.0000 0026	0.0000 0006	0.0000 0001		
1.61	0.0000 0030	0.0000 0007	0.0000 0002		
1.62	0.0000 0034	0.0000 0008	0.0000 0002	0.0000 0000	
1.63	0.0000 0039	0.0000 0009	0.0000 0002	0.0000 0001	
1.64	0.0000 0044	0.0000 0011	0.0000 0003	0.0000 0001	
1.65	0.0000 0051	0.0000 0012	0.0000 0003	0.0000 0001	
1.66	0.0000 0058	0.0000 0014	0.0000 0004	0.0000 0001	
1.67	0.0000 0066	0.0000 0017	0.0000 0004	0.0000 0001	
1.68	0.0000 0076	0.0000 0019	0.0000 0005	0.0000 0001	
1.69	0.0000 0087	0.0000 0022	0.0000 0006	0.0000 0001	
1.70	0.0000 0099	0.0000 0026	0.0000 0007	0.0000 0002	0.0000 0000
1.71	0.0000 0112	0.0000 0030	0.0000 0008	0.0000 0002	0.0000 0001
1.72	0.0000 0128	0.0000 0034	0.0000 0009	0.0000 0002	0.0000 0001
1.73	0.0000 0145	0.0000 0039	0.0000 0010	0.0000 0003	0.0000 0001
1.74	0.0000 0165	0.0000 0045	0.0000 0012	0.0000 0003	0.0000 0001
1.75	0.0000 0187	0.0000 0052	0.0000 0014	0.0000 0004	0.0000 0001
1.76	0.0000 0212	0.0000 0059	0.0000 0016	0.0000 0005	0.0000 0001
1.77	0.0000 0240	0.0000 0068	0.0000 0019	0.0000 0005	0.0000 0001
1.78	0.0000 0272	0.0000 0078	0.0000 0022	0.0000 0006	0.0000 0002
1.79	0.0000 0308	0.0000 0089	0.0000 0025	0.0000 0007	0.0000 0002
1.80	0.0000 0348	0.0000 0101	0.0000 0029	0.0000 0008	0.0000 0002
1.81	0.0000 0393	0.0000 0116	0.0000 0034	0.0000 0010	0.0000 0003
1.82	0.0000 0444	0.0000 0132	0.0000 0039	0.0000 0012	0.0000 0003
1.83	0.0000 0501	0.0000 0151	0.0000 0045	0.0000 0013	0.0000 0004
1.84	0.0000 0564	0.0000 0172	0.0000 0052	0.0000 0016	0.0000 0005
1.85	0.0000 0636	0.0000 0196	0.0000 0060	0.0000 0018	0.0000 0006
1.86	0.0000 0715	0.0000 0223	0.0000 0069	0.0000 0021	0.0000 0007
1.87	0.0000 0805	0.0000 0253	0.0000 0079	0.0000 0025	0.0000 0008
1.88	0.0000 0905	0.0000 0288	0.0000 0091	0.0000 0029	0.0000 0009
1.89	0.0000 1016	0.0000 0326	0.0000 0104	0.0000 0033	0.0000 0011
1.90	0.0000 1140	0.0000 0370	0.0000 0120	0.0000 0038	0.0000 0012
1.91	0.0000 1279	0.0000 0420	0.0000 0137	0.0000 0044	0.0000 0014
1.92	0.0000 1434	0.0000 0475	0.0000 0157	0.0000 0051	0.0000 0017
1.93	0.0000 1607	0.0000 0538	0.0000 0179	0.0000 0059	0.0000 0020
1.94	0.0000 1799	0.0000 0609	0.0000 0205	0.0000 0069	0.0000 0023
1.95	0.0000 2012	0.0000 0688	0.0000 0234	0.0000 0079	0.0000 0027
1.96	0.0000 2250	0.0000 0777	0.0000 0267	0.0000 0091	0.0000 0031
1.97	0.0000 2514	0.0000 0877	0.0000 0304	0.0000 0105	0.0000 0036
1.98	0.0000 2807	0.0000 0990	0.0000 0347	0.0000 0121	0.0000 0042
1.99	0.0000 3133	0.0000 1115	0.0000 0395	0.0000 0139	0.0000 0049
2.00	0.0000 3494	0.0000 1257	0.0000 0449	0.0000 0160	0.0000 0057

W	P(W,24)	P(W,26)	P(W,28)	P(W,30)	P(W,32)
2.01	0.0000 3895	0.0000 1415	0.0000 0511	0.0000 0184	0.0000 0066
2.02	0.0000 4338	0.0000 1591	0.0000 0581	0.0000 0211	0.0000 0076
2.03	0.0000 4830	0.0000 1789	0.0000 0659	0.0000 0242	0.0000 0088
2.04	0.0000 5373	0.0000 2010	0.0000 0748	0.0000 0277	0.0000 0102
2.05	0.0000 5975	0.0000 2257	0.0000 0848	0.0000 0317	0.0000 0118
2.06	0.0000 6640	0.0000 2532	0.0000 0961	0.0000 0363	0.0000 0136
2.07	0.0000 7374	0.0000 2840	0.0000 1088	0.0000 0415	0.0000 0158
2.08	0.0000 8185	0.0000 3183	0.0000 1231	0.0000 0474	0.0000 0182
2.09	0.0000 9080	0.0000 3564	0.0000 1392	0.0000 0541	0.0000 0209
2.10	0.0001 0068	0.0000 3990	0.0000 1573	0.0000 0617	0.0000 0241
2.11	0.0001 1156	0.0000 4463	0.0000 1776	0.0000 0703	0.0000 0278
2.12	0.0001 2355	0.0000 4989	0.0000 2004	0.0000 0801	0.0000 0319
2.13	0.0001 3675	0.0000 5574	0.0000 2260	0.0000 0912	0.0000 0367
2.14	0.0001 5128	0.0000 6224	0.0000 2547	0.0000 1038	0.0000 0421
2.15	0.0001 6726	0.0000 6946	0.0000 2869	0.0000 1180	0.0000 0483
2.16	0.0001 8483	0.0000 7746	0.0000 3230	0.0000 1340	0.0000 0554
2.17	0.0002 0413	0.0000 8634	0.0000 3633	0.0000 1522	0.0000 0635
2.18	0.0002 2533	0.0000 9618	0.0000 4084	0.0000 1726	0.0000 0727
2.19	0.0002 4860	0.0001 0708	0.0000 4589	0.0000 1957	0.0000 0832
2.20	0.0002 7412	0.0001 1915	0.0000 5152	0.0000 2218	0.0000 0951
2.21	0.0003 0211	0.0001 3251	0.0000 5782	0.0000 2511	0.0000 1086
2.22	0.0003 3278	0.0001 4727	0.0000 6484	0.0000 2842	0.0000 1241
2.23	0.0003 6637	0.0001 6359	0.0000 7267	0.0000 3214	0.0000 1415
2.24	0.0004 0315	0.0001 8162	0.0000 8140	0.0000 3632	0.0000 1614
2.25	0.0004 4340	0.0002 0153	0.0000 9112	0.0000 4102	0.0000 1839
2.26	0.0004 8741	0.0002 2349	0.0001 0195	0.0000 4630	0.0000 2094
2.27	0.0005 3552	0.0002 4771	0.0001 1400	0.0000 5222	0.0000 2383
2.28	0.0005 8809	0.0002 7441	0.0001 2739	0.0000 5887	0.0000 2710
2.29	0.0006 4549	0.0003 0383	0.0001 4228	0.0000 6633	0.0000 3080
2.30	0.0007 0815	0.0003 3621	0.0001 5881	0.0000 7468	0.0000 3498
2.31	0.0007 7650	0.0003 7185	0.0001 7716	0.0000 8403	0.0000 3970
2.32	0.0008 5104	0.0004 1105	0.0001 9753	0.0000 9450	0.0000 4503
2.33	0.0009 3228	0.0004 5415	0.0002 2011	0.0001 0620	0.0000 5105
2.34	0.0010 2078	0.0005 0150	0.0002 4513	0.0001 1929	0.0000 5783
2.35	0.0011 1714	0.0005 5350	0.0002 7285	0.0001 3391	0.0000 6546
2.36	0.0012 2201	0.0006 1057	0.0003 0353	0.0001 5023	0.0000 7406
2.37	0.0013 3609	0.0006 7319	0.0003 3748	0.0001 6844	0.0000 8374
2.38	0.0014 6012	0.0007 4185	0.0003 7502	0.0001 8875	0.0000 9463
2.39	0.0015 9492	0.0008 1709	0.0004 1650	0.0002 1138	0.0001 0686
2.40	0.0017 4135	0.0008 9952	0.0004 6233	0.0002 3659	0.0001 2060
2.41	0.0019 0033	0.0009 8976	0.0005 1292	0.0002 6465	0.0001 3603
2.42	0.0020 7286	0.0010 8850	0.0005 6874	0.0002 9588	0.0001 5333
2.43	0.0022 6001	0.0011 9651	0.0006 3031	0.0003 3060	0.0001 7274
2.44	0.0024 6293	0.0013 1457	0.0006 9816	0.0003 6918	0.0001 9448
2.45	0.0026 8283	0.0014 4357	0.0007 7291	0.0004 1204	0.0002 1882
2.46	0.0029 2102	0.0015 8446	0.0008 5521	0.0004 5961	0.0002 4607
2.47	0.0031 7892	0.0017 3824	0.0009 4578	0.0005 1239	0.0002 7654
2.48	0.0034 5803	0.0019 0601	0.0010 4540	0.0005 7091	0.0003 1061
2.49	0.0037 5993	0.0020 8897	0.0011 5491	0.0006 3577	0.0003 4867
2.50	0.0040 8636	0.0022 8838	0.0012 7523	0.0007 0760	0.0003 9116

W	P(W,24)	P(W,26)	P(W,28)	P(W,30)	P(W,32)
2.51	0.0044 3914	0.0025 0561	0.0014 0736	0.0007 8712	0.0004 3857
2.52	0.0048 2021	0.0027 4215	0.0015 5238	0.0008 7509	0.0004 9145
2.53	0.0052 3167	0.0029 9959	0.0017 1147	0.0009 7237	0.0005 5038
2.54	0.0056 7573	0.0032 7962	0.0018 8590	0.0010 7987	0.0006 1603
2.55	0.0061 5475	0.0035 8409	0.0020 7705	0.0011 9861	0.0006 8911
2.56	0.0066 7125	0.0039 1497	0.0022 8641	0.0013 2968	0.0007 7042
2.57	0.0072 2791	0.0042 7437	0.0025 1560	0.0014 7430	0.0008 6084
2.58	0.0078 2757	0.0046 6455	0.0027 6638	0.0016 3377	0.0009 6131
2.59	0.0084 7326	0.0050 8796	0.0030 4062	0.0018 0952	0.0010 7291
2.60	0.0091 6820	0.0055 4720	0.0033 4037	0.0020 0311	0.0011 9679
2.61	0.0099 1579	0.0060 4504	0.0036 6783	0.0022 1622	0.0013 3421
2.62	0.0107 1966	0.0065 8449	0.0040 2538	0.0024 5071	0.0014 8659
2.63	0.0115 8365	0.0071 6871	0.0044 1558	0.0027 0858	0.0016 5543
2.64	0.0125 1183	0.0078 0113	0.0048 4119	0.0029 9199	0.0018 4242
2.65	0.0135 0849	0.0084 8538	0.0053 0519	0.0033 0331	0.0020 4938
2.66	0.0145 7821	0.0092 2534	0.0058 1077	0.0036 4509	0.0022 7832
2.67	0.0157 2579	0.0100 2516	0.0063 6137	0.0040 2013	0.0025 3143
2.68	0.0169 5634	0.0108 8925	0.0069 6068	0.0044 3141	0.0028 1109
2.69	0.0182 7524	0.0118 2231	0.0076 1268	0.0048 8220	0.0031 1990
2.70	0.0196 8816	0.0128 2936	0.0083 2163	0.0053 7602	0.0034 6072
2.71	0.0212 0109	0.0139 1570	0.0090 9209	0.0059 1668	0.0038 3664
2.72	0.0228 2035	0.0150 8699	0.0099 2895	0.0065 0829	0.0042 5103
2.73	0.0245 5257	0.0163 4925	0.0108 3746	0.0071 5528	0.0047 0756
2.74	0.0264 0476	0.0177 0885	0.0118 2322	0.0078 6246	0.0052 1022
2.75	0.0283 8427	0.0191 7255	0.0128 9224	0.0086 3497	0.0057 6335
2.76	0.0304 9881	0.0207 4752	0.0140 5091	0.0094 7839	0.0063 7165
2.77	0.0327 5651	0.0224 4134	0.0153 0608	0.0103 9869	0.0070 4023
2.78	0.0351 6586	0.0242 6203	0.0166 6505	0.0114 0232	0.0077 7463
2.79	0.0377 3578	0.0262 1808	0.0181 3559	0.0124 9618	0.0085 8084
2.80	0.0404 7559	0.0283 1844	0.0197 2598	0.0136 8771	0.0094 6535
2.81	0.0433 9505	0.0305 7256	0.0214 4503	0.0149 8487	0.0104 3517
2.82	0.0465 0436	0.0329 9042	0.0233 0212	0.0163 9619	0.0114 9788
2.83	0.0498 1415	0.0355 8249	0.0253 0719	0.0179 3081	0.0126 6167
2.84	0.0533 3552	0.0383 5982	0.0274 7080	0.0195 9852	0.0139 3534
2.85	0.0570 8002	0.0413 3400	0.0298 0413	0.0214 0977	0.0153 2842
2.86	0.0610 5967	0.0445 1722	0.0323 1905	0.0233 7571	0.0168 5112
2.87	0.0652 8696	0.0479 2224	0.0350 2808	0.0255 0826	0.0185 1446
2.88	0.0697 7484	0.0515 6244	0.0379 4446	0.0278 2009	0.0203 3024
2.89	0.0745 3673	0.0554 5181	0.0410 8219	0.0303 2471	0.0223 1115
2.90	0.0795 8653	0.0596 0497	0.0444 5600	0.0330 3647	0.0244 7079
2.91	0.0849 3858	0.0640 3718	0.0480 8140	0.0359 7063	0.0268 2370
2.92	0.0906 0767	0.0687 6432	0.0519 7471	0.0391 4334	0.0293 8547
2.93	0.0966 0905	0.0738 0293	0.0561 5307	0.0425 7174	0.0321 7270
2.94	0.1029 5837	0.0791 7016	0.0606 3443	0.0462 7394	0.0352 0315
2.95	0.1096 7169	0.0848 8383	0.0654 3761	0.0502 6909	0.0384 9571
2.96	0.1167 6545	0.0909 6235	0.0705 8226	0.0545 7737	0.0420 7048
2.97	0.1242 5641	0.0974 2475	0.0760 8888	0.0592 2004	0.0459 4884
2.98	0.1321 6167	0.1042 9064	0.0819 7885	0.0642 1946	0.0501 5342
2.99	0.1404 9859	0.1115 8018	0.0882 7436	0.0695 9909	0.0547 0823
3.00	0.1492 8472	0.1193 1406	0.0949 9844	0.0753 8350	0.0596 3863

W	P(W,24)	P(W,26)	P(W,28)	P(W,30)	P(W,32)
3.01	0.1585 3780	0.1275 1344	0.1021 7492	0.0815 9838	0.0649 7137
3.02	0.1682 7565	0.1361 9991	0.1098 2840	0.0882 7053	0.0707 3464
3.03	0.1785 1609	0.1453 9540	0.1179 8421	0.0954 2783	0.0769 5805
3.04	0.1892 7691	0.1551 2215	0.1266 6834	0.1030 9924	0.0836 7265
3.05	0.2005 7569	0.1654 0258	0.1359 0737	0.1113 1470	0.0909 1092
3.06	0.2124 2978	0.1762 5921	0.1457 2842	0.1201 0516	0.0987 0673
3.07	0.2248 5608	0.1877 1454	0.1561 5900	0.1295 0239	0.1070 9530
3.08	0.2378 7101	0.1997 9090	0.1672 2693	0.1395 3900	0.1161 1318
3.09	0.2514 9026	0.2125 1033	0.1789 6015	0.1502 4823	0.1257 9807
3.10	0.2657 2868	0.2258 9436	0.1913 8662	0.1616 6383	0.1361 8882
3.11	0.2806 0009	0.2399 6386	0.2045 3406	0.1738 1992	0.1473 2517
3.12	0.2961 1703	0.2547 3879	0.2184 2975	0.1867 5073	0.1592 4768
3.13	0.3122 9057	0.2702 3794	0.2331 0030	0.2004 9037	0.1719 9741
3.14	0.3291 3002	0.2864 7867	0.2485 7132	0.2150 7256	0.1856 1571
3.15	0.3466 4270	0.3034 7661	0.2648 6711	0.2305 3027	0.2001 4389
3.16	0.3648 3358	0.3212 4526	0.2820 1027	0.2468 9533	0.2156 2281
3.17	0.3837 0497	0.3397 9565	0.3000 2126	0.2641 9799	0.2320 9247
3.18	0.4032 5615	0.3591 3588	0.3189 1796	0.2824 6640	0.2495 9142
3.19	0.4234 8294	0.3792 7065	0.3387 1509	0.3017 2603	0.2681 5621
3.20	0.4443 7728	0.4002 0074	0.3594 2360	0.3219 9899	0.2878 2067
3.21	0.4659 2674	0.4219 2238	0.3810 5001	0.3433 0327	0.3086 1502
3.22	0.4881 1400	0.4444 2667	0.4035 9565	0.3656 5186	0.3305 6501
3.23	0.5109 1624	0.4676 9881	0.4270 5579	0.3890 5183	0.3536 9079
3.24	0.5343 0456	0.4917 1734	0.4514 1871	0.4135 0317	0.3780 0568
3.25	0.5582 4326	0.5164 5327	0.4766 6465	0.4389 9759	0.4035 1478
3.26	0.5826 8912	0.5418 6914	0.5027 6464	0.4655 1713	0.4302 1335
3.27	0.6075 9058	0.5679 1799	0.5296 7921	0.4930 3261	0.4580 8500
3.28	0.6328 8691	0.5945 4219	0.5573 5699	0.5215 0187	0.4870 9966
3.29	0.6585 0720	0.6216 7224	0.5857 3309	0.5508 6789	0.5172 1126
3.30	0.6843 6938	0.6492 2537	0.6147 2737	0.5810 5657	0.5483 5510
3.31	0.7103 7912	0.6771 0411	0.6442 4257	0.6119 7437	0.5804 4496
3.32	0.7364 2861	0.7051 9461	0.6741 6213	0.6435 0563	0.6133 6980
3.33	0.7623 9526	0.7333 6491	0.7043 4790	0.6755 0957	0.6469 9006
3.34	0.7881 4035	0.7614 6301	0.7346 3761	0.7078 1707	0.6811 3354
3.35	0.8135 0748	0.7893 1479	0.7648 4200	0.7402 2696	0.7155 9084
3.36	0.8383 2095	0.8167 2172	0.7947 4181	0.7725 0202	0.7501 1013
3.37	0.8623 8404	0.8434 5838	0.8240 8441	0.8043 6453	0.7843 9147
3.38	0.8854 7710	0.8692 6982	0.8525 8005	0.8354 9136	0.8180 8044
3.39	0.9073 5551	0.8938 6858	0.8798 9788	0.8655 0852	0.8507 6097
3.40	0.9277 4754	0.9169 3161	0.9056 6155	0.8939 8519	0.8819 4748
3.41	0.9463 5197	0.9380 9678	0.9294 4431	0.9204 2713	0.9110 7615
3.42	0.9628 3557	0.9569 5919	0.9507 6386	0.9442 6947	0.9374 9512
3.43	0.9768 3041	0.9730 6720	0.9690 7651	0.9648 6868	0.9604 5378
3.44	0.9879 3093	0.9859 1802	0.9837 7098	0.9814 9391	0.9790 9082
3.45	0.9956 9083	0.9949 5308	0.9941 6160	0.9933 1729	0.9924 2108
3.460	0.9996 1972	0.9995 5291	0.9994 8082	0.9994 0348	0.9993 2090
3.461	0.9997 8162	0.9997 4316	0.9997 0163	0.9996 5705	0.9996 0942
3.462	0.9998 9931	0.9998 8153	0.9998 6233	0.9998 4169	0.9998 1964
3.463	0.9999 7222	0.9999 6730	0.9999 6198	0.9999 5627	0.9999 5016
3.464	0.9999 9976	0.9999 9972	0.9999 9967	0.9999 9963	0.9999 9957

W	P(W,34)	P(W,36)	P(W,38)	P(W,40)	P(W,50)
1.51					
1.52					
1.53					
1.54					
1.55					
1.56					
1.57					
1.58					
1.59					
1.60					
1.61					
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1.67					
1.68					
1.69					
1.70					
1.71					
1.72					
1.73					
1.74					
1.75					
1.76					
1.77					
1.78	0.0000 0000				
1.79	0.0000 0001				
1.80	0.0000 0001				
1.81	0.0000 0001				
1.82	0.0000 0001				
1.83	0.0000 0001				
1.84	0.0000 0001				
1.85	0.0000 0002	0.0000 0000			
1.86	0.0000 0002	0.0000 0001			
1.87	0.0000 0002	0.0000 0001			
1.88	0.0000 0003	0.0000 0001			
1.89	0.0000 0003	0.0000 0001			
1.90	0.0000 0004	0.0000 0001			
1.91	0.0000 0005	0.0000 0001	0.0000 0000		
1.92	0.0000 0005	0.0000 0002	0.0000 0001		
1.93	0.0000 0006	0.0000 0002	0.0000 0001		
1.94	0.0000 0008	0.0000 0003	0.0000 0001		
1.95	0.0000 0009	0.0000 0003	0.0000 0001		
1.96	0.0000 0011	0.0000 0004	0.0000 0001		
1.97	0.0000 0012	0.0000 0004	0.0000 0001	0.0000 0000	
1.98	0.0000 0015	0.0000 0005	0.0000 0002	0.0000 0001	
1.99	0.0000 0017	0.0000 0006	0.0000 0002	0.0000 0001	
2.00	0.0000 0020	0.0000 0007	0.0000 0002	0.0000 0001	

W	P(W,34)	P(W,36)	P(W,38)	P(W,40)	P(W,50)
2.01	0.0000 0023	0.0000 0008	0.0000 0003	0.0000 0001	
2.02	0.0000 0027	0.0000 0010	0.0000 0004	0.0000 0001	
2.03	0.0000 0032	0.0000 0012	0.0000 0004	0.0000 0002	
2.04	0.0000 0038	0.0000 0014	0.0000 0005	0.0000 0002	
2.05	0.0000 0044	0.0000 0016	0.0000 0006	0.0000 0002	
2.06	0.0000 0051	0.0000 0019	0.0000 0007	0.0000 0003	
2.07	0.0000 0060	0.0000 0022	0.0000 0008	0.0000 0003	
2.08	0.0000 0069	0.0000 0026	0.0000 0010	0.0000 0004	
2.09	0.0000 0081	0.0000 0031	0.0000 0012	0.0000 0005	
2.10	0.0000 0094	0.0000 0036	0.0000 0014	0.0000 0005	
2.11	0.0000 0109	0.0000 0043	0.0000 0017	0.0000 0007	
2.12	0.0000 0127	0.0000 0050	0.0000 0020	0.0000 0008	
2.13	0.0000 0147	0.0000 0059	0.0000 0023	0.0000 0009	
2.14	0.0000 0170	0.0000 0069	0.0000 0028	0.0000 0011	
2.15	0.0000 0197	0.0000 0080	0.0000 0033	0.0000 0013	
2.16	0.0000 0228	0.0000 0094	0.0000 0038	0.0000 0016	
2.17	0.0000 0264	0.0000 0109	0.0000 0045	0.0000 0019	
2.18	0.0000 0305	0.0000 0128	0.0000 0053	0.0000 0022	
2.19	0.0000 0352	0.0000 0149	0.0000 0063	0.0000 0026	
2.20	0.0000 0406	0.0000 0173	0.0000 0073	0.0000 0031	
2.21	0.0000 0468	0.0000 0201	0.0000 0086	0.0000 0037	0.0000 0000
2.22	0.0000 0540	0.0000 0234	0.0000 0101	0.0000 0044	0.0000 0001
2.23	0.0000 0621	0.0000 0272	0.0000 0119	0.0000 0052	0.0000 0001
2.24	0.0000 0715	0.0000 0316	0.0000 0139	0.0000 0061	0.0000 0001
2.25	0.0000 0822	0.0000 0366	0.0000 0163	0.0000 0072	0.0000 0001
2.26	0.0000 0944	0.0000 0424	0.0000 0190	0.0000 0085	0.0000 0001
2.27	0.0000 1084	0.0000 0491	0.0000 0222	0.0000 0100	0.0000 0002
2.28	0.0000 1243	0.0000 0569	0.0000 0259	0.0000 0118	0.0000 0002
2.29	0.0000 1425	0.0000 0658	0.0000 0302	0.0000 0139	0.0000 0003
2.30	0.0000 1633	0.0000 0760	0.0000 0353	0.0000 0163	0.0000 0003
2.31	0.0000 1869	0.0000 0877	0.0000 0411	0.0000 0192	0.0000 0004
2.32	0.0000 2139	0.0000 1012	0.0000 0478	0.0000 0225	0.0000 0005
2.33	0.0000 2445	0.0000 1167	0.0000 0556	0.0000 0264	0.0000 0006
2.34	0.0000 2793	0.0000 1345	0.0000 0646	0.0000 0310	0.0000 0008
2.35	0.0000 3189	0.0000 1549	0.0000 0750	0.0000 0363	0.0000 0009
2.36	0.0000 3639	0.0000 1782	0.0000 0871	0.0000 0424	0.0000 0011
2.37	0.0000 4149	0.0000 2050	0.0000 1010	0.0000 0496	0.0000 0014
2.38	0.0000 4728	0.0000 2355	0.0000 1170	0.0000 0580	0.0000 0017
2.39	0.0000 5384	0.0000 2704	0.0000 1355	0.0000 0677	0.0000 0020
2.40	0.0000 6127	0.0000 3103	0.0000 1567	0.0000 0790	0.0000 0025
2.41	0.0000 6968	0.0000 3558	0.0000 1812	0.0000 0921	0.0000 0030
2.42	0.0000 7919	0.0000 4078	0.0000 2094	0.0000 1073	0.0000 0037
2.43	0.0000 8995	0.0000 4670	0.0000 2418	0.0000 1249	0.0000 0045
2.44	0.0001 0210	0.0000 5344	0.0000 2789	0.0000 1452	0.0000 0054
2.45	0.0001 1582	0.0000 6111	0.0000 3216	0.0000 1688	0.0000 0065
2.46	0.0001 3130	0.0000 6985	0.0000 3706	0.0000 1961	0.0000 0079
2.47	0.0001 4875	0.0000 7977	0.0000 4266	0.0000 2276	0.0000 0096
2.48	0.0001 6842	0.0000 9105	0.0000 4909	0.0000 2640	0.0000 0115
2.49	0.0001 9057	0.0001 0385	0.0000 5644	0.0000 3060	0.0000 0139
2.50	0.0002 1551	0.0001 1838	0.0000 6485	0.0000 3544	0.0000 0168

W	P(W,34)	P(W,36)	P(W,38)	P(W,40)	P(W,50)
2.51	0.0002 4355	0.0001 3485	0.0000 7446	0.0000 4102	0.0000 0202
2.52	0.0002 7508	0.0001 5351	0.0000 8544	0.0000 4744	0.0000 0243
2.53	0.0003 1050	0.0001 7464	0.0000 9797	0.0000 5483	0.0000 0292
2.54	0.0003 5026	0.0001 9856	0.0001 1226	0.0000 6332	0.0000 0351
2.55	0.0003 9488	0.0002 2561	0.0001 2855	0.0000 7308	0.0000 0421
2.56	0.0004 4491	0.0002 5618	0.0001 4711	0.0000 8428	0.0000 0505
2.57	0.0005 0098	0.0002 9070	0.0001 6824	0.0000 9713	0.0000 0605
2.58	0.0005 6378	0.0003 2967	0.0001 9227	0.0001 1186	0.0000 0724
2.59	0.0006 3407	0.0003 7363	0.0002 1958	0.0001 2874	0.0000 0866
2.60	0.0007 1271	0.0004 2319	0.0002 5062	0.0001 4807	0.0000 1035
2.61	0.0008 0061	0.0004 7902	0.0002 8585	0.0001 7018	0.0000 1236
2.62	0.0008 9883	0.0005 4187	0.0003 2582	0.0001 9545	0.0000 1475
2.63	0.0010 0849	0.0006 1260	0.0003 7114	0.0002 2433	0.0000 1758
2.64	0.0011 3087	0.0006 9212	0.0004 2249	0.0002 5729	0.0000 2094
2.65	0.0012 6735	0.0007 8148	0.0004 8063	0.0002 9490	0.0000 2492
2.66	0.0014 1947	0.0008 8183	0.0005 4641	0.0003 3778	0.0000 2963
2.67	0.0015 8891	0.0009 9446	0.0006 2080	0.0003 8664	0.0000 3521
2.68	0.0017 7754	0.0011 2078	0.0007 0486	0.0004 4226	0.0000 4180
2.69	0.0019 8739	0.0012 6237	0.0007 9979	0.0005 0554	0.0000 4958
2.70	0.0022 2072	0.0014 2097	0.0009 0691	0.0005 7748	0.0000 5876
2.71	0.0024 7999	0.0015 9852	0.0010 2773	0.0006 5922	0.0000 6958
2.72	0.0027 6791	0.0017 9715	0.0011 6388	0.0007 5203	0.0000 8234
2.73	0.0030 8745	0.0020 1922	0.0013 1723	0.0008 5732	0.0000 9735
2.74	0.0034 4187	0.0022 6733	0.0014 8983	0.0009 7670	0.0001 1500
2.75	0.0038 3473	0.0025 4437	0.0016 8396	0.0011 1196	0.0001 3575
2.76	0.0042 6993	0.0028 5351	0.0019 0216	0.0012 6510	0.0001 6010
2.77	0.0047 5174	0.0031 9825	0.0021 4726	0.0014 3837	0.0001 8868
2.78	0.0052 8481	0.0035 8243	0.0024 2238	0.0016 3427	0.0002 2217
2.79	0.0058 7422	0.0040 1028	0.0027 3099	0.0018 5560	0.0002 6140
2.80	0.0065 2554	0.0044 8647	0.0030 7693	0.0021 0550	0.0003 0731
2.81	0.0072 4479	0.0050 1609	0.0034 6445	0.0023 8743	0.0003 6099
2.82	0.0080 3856	0.0056 0477	0.0038 9825	0.0027 0529	0.0004 2370
2.83	0.0089 1401	0.0062 5864	0.0043 8353	0.0030 6340	0.0004 9689
2.84	0.0098 7893	0.0069 8444	0.0049 2601	0.0034 6656	0.0005 8227
2.85	0.0109 4175	0.0077 8953	0.0055 3201	0.0039 2011	0.0006 8175
2.86	0.0121 1166	0.0086 8198	0.0062 0849	0.0044 2997	0.0007 9758
2.87	0.0133 9858	0.0096 7059	0.0069 6312	0.0050 0272	0.0009 3232
2.88	0.0148 1327	0.0107 6494	0.0078 0431	0.0056 4564	0.0010 8894
2.89	0.0163 6737	0.0119 7551	0.0087 4131	0.0063 6678	0.0012 7082
2.90	0.0180 7345	0.0133 1370	0.0097 8428	0.0071 7505	0.0014 8184
2.91	0.0199 4508	0.0147 9190	0.0109 4435	0.0080 8028	0.0017 2648
2.92	0.0219 9689	0.0164 2357	0.0122 3370	0.0090 9333	0.0020 0982
2.93	0.0242 4463	0.0182 2335	0.0136 6564	0.0102 2616	0.0023 3770
2.94	0.0267 0525	0.0202 0706	0.0152 5475	0.0114 9192	0.0027 1677
2.95	0.0293 9694	0.0223 9187	0.0170 1690	0.0129 0510	0.0031 5464
2.96	0.0323 3922	0.0247 9634	0.0189 6940	0.0144 8158	0.0036 5994
2.97	0.0355 5301	0.0274 4048	0.0211 3107	0.0162 3879	0.0042 4252
2.98	0.0390 6066	0.0303 4590	0.0235 2240	0.0181 9582	0.0049 1356
2.99	0.0428 8608	0.0335 3586	0.0261 6561	0.0203 7353	0.0056 8576
3.00	0.0470 5472	0.0370 3535	0.0290 8475	0.0227 9474	0.0065 7349

W	P(W,34)	P(W,36)	P(W,38)	P(W,40)	P(W,50)
3.01	0.0515 9370	0.0408 7123	0.0323 0589	0.0254 8430	0.0075 9303
3.02	0.0565 3183	0.0450 7224	0.0358 5717	0.0284 6927	0.0087 6277
3.03	0.0618 9965	0.0496 6915	0.0397 6892	0.0317 7908	0.0101 0348
3.04	0.0677 2948	0.0546 9477	0.0440 7381	0.0354 4566	0.0116 3853
3.05	0.0740 5546	0.0601 8408	0.0488 0693	0.0395 0358	0.0133 9422
3.06	0.0809 1352	0.0661 7426	0.0540 0589	0.0439 9020	0.0154 0009
3.07	0.0883 4143	0.0727 0471	0.0597 1093	0.0489 4584	0.0176 8924
3.08	0.0963 7876	0.0798 1713	0.0659 6498	0.0544 1388	0.0202 9870
3.09	0.1050 6681	0.0875 5547	0.0728 1373	0.0604 4088	0.0232 6981
3.10	0.1144 4857	0.0959 6594	0.0803 0568	0.0670 7671	0.0266 4864
3.11	0.1245 6862	0.1050 9698	0.0884 9215	0.0743 7463	0.0304 8639
3.12	0.1354 7297	0.1149 9914	0.0974 2723	0.0823 9128	0.0348 3985
3.13	0.1472 0888	0.1257 2496	0.1071 6776	0.0911 8679	0.0397 7181
3.14	0.1598 2464	0.1373 2880	0.1177 7321	0.1008 2468	0.0453 5155
3.15	0.1733 6928	0.1498 6662	0.1293 0548	0.1113 7179	0.0516 5524
3.16	0.1878 9221	0.1633 9561	0.1418 2868	0.1228 9813	0.0587 6635
3.17	0.2034 4277	0.1779 7388	0.1554 0882	0.1354 7661	0.0667 7605
3.18	0.2200 6976	0.1936 5990	0.1701 1333	0.1491 8273	0.0757 8346
3.19	0.2378 2075	0.2105 1196	0.1860 1058	0.1640 9407	0.0858 9593
3.20	0.2567 4143	0.2285 8743	0.2031 6914	0.1802 8971	0.0972 2908
3.21	0.2768 7469	0.2479 4188	0.2216 5697	0.1978 4941	0.1099 0673
3.22	0.2982 5966	0.2686 2807	0.2415 4040	0.2168 5265	0.1240 6064
3.23	0.3209 3049	0.2906 9474	0.2628 8285	0.2373 7740	0.1398 2989
3.24	0.3449 1508	0.3141 8511	0.2857 4337	0.2594 9857	0.1573 5999
3.25	0.3702 3342	0.3391 3527	0.3101 7484	0.2832 8625	0.1768 0148
3.26	0.3968 9587	0.3655 7214	0.3362 2189	0.3088 0344	0.1983 0799
3.27	0.4249 0107	0.3935 1123	0.3639 1837	0.3361 0344	0.2220 3365
3.28	0.4542 3356	0.4229 5398	0.3932 8445	0.3652 2667	0.2481 2958
3.29	0.4848 6114	0.4538 8465	0.4243 2322	0.3961 9697	0.2767 3942
3.30	0.5167 3174	0.4862 6684	0.4570 1666	0.4290 1714	0.3079 9352
3.31	0.5497 7000	0.5200 3942	0.4913 2106	0.4636 6379	0.3420 0167
3.32	0.5838 7327	0.5551 1189	0.5271 6164	0.5000 8123	0.3788 4398
3.33	0.6189 0718	0.5913 5905	0.5644 2634	0.5381 7442	0.4185 5946
3.34	0.6547 0055	0.6286 1494	0.6029 5872	0.5778 0062	0.4611 3207
3.35	0.6910 3971	0.6666 6597	0.6425 4971	0.6187 5988	0.5064 7349
3.36	0.7276 6209	0.7052 4304	0.6829 2822	0.6607 8384	0.5544 0215
3.37	0.7642 4901	0.7440 1265	0.7237 5032	0.7035 2292	0.6046 1771
3.38	0.8004 1750	0.7825 6679	0.7645 8696	0.7465 3146	0.6566 7030
3.39	0.8357 1131	0.8204 1156	0.8049 0983	0.7892 5063	0.7099 2326
3.40	0.8695 9063	0.8569 5422	0.8440 7536	0.8309 8882	0.7635 0857
3.41	0.9014 2071	0.8914 8868	0.8813 0647	0.8708 9913	0.8162 7335
3.42	0.9304 5913	0.9231 7908	0.9156 7183	0.9079 5353	0.8667 1599
3.43	0.9558 4151	0.9510 4131	0.9460 6232	0.9409 1338	0.9129 1009
3.44	0.9765 6566	0.9739 2226	0.9711 6439	0.9682 9574	0.9524 1407
3.45	0.9914 7385	0.9904 7650	0.9894 2991	0.9883 3493	0.9821 6392
3.460	0.9992 3311	0.9991 4014	0.9990 4201	0.9989 3876	0.9983 4636
3.461	0.9995 5877	0.9995 0509	0.9994 4840	0.9993 8871	0.9990 4565
3.462	0.9997 9617	0.9997 7128	0.9997 4499	0.9997 1728	0.9995 5778
3.463	0.9999 4365	0.9999 3675	0.9999 2945	0.9999 2175	0.9998 7737
3.464	0.9999 9952	0.9999 9946	0.9999 9940	0.9999 9933	0.9999 9895

W	P(W,60)	P(W,70)	P(W,80)	P(W,90)	P(W,100)
2.01					
2.02					
2.03					
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2.32					
2.33					
2.34					
2.35					
2.36					
2.37					
2.38	0.0000 0000				
2.39	0.0000 0001				
2.40	0.0000 0001				
2.41	0.0000 0001				
2.42	0.0000 0001				
2.43	0.0000 0002				
2.44	0.0000 0002				
2.45	0.0000 0002				
2.46	0.0000 0003				
2.47	0.0000 0004				
2.48	0.0000 0005				
2.49	0.0000 0006				
2.50	0.0000 0008				

W	P(W,60)	P(W,70)	P(W,80)	P(W,90)	P(W,100)
2.51	0.0000 0010	0.0000 0000			
2.52	0.0000 0012	0.0000 0001			
2.53	0.0000 0015	0.0000 0001			
2.54	0.0000 0019	0.0000 0001			
2.55	0.0000 0023	0.0000 0001			
2.56	0.0000 0029	0.0000 0002			
2.57	0.0000 0036	0.0000 0002			
2.58	0.0000 0045	0.0000 0003			
2.59	0.0000 0056	0.0000 0004			
2.60	0.0000 0070	0.0000 0005			
2.61	0.0000 0087	0.0000 0006	0.0000 0000		
2.62	0.0000 0107	0.0000 0008	0.0000 0001		
2.63	0.0000 0133	0.0000 0010	0.0000 0001		
2.64	0.0000 0164	0.0000 0013	0.0000 0001		
2.65	0.0000 0203	0.0000 0016	0.0000 0001		
2.66	0.0000 0251	0.0000 0021	0.0000 0002		
2.67	0.0000 0309	0.0000 0027	0.0000 0002		
2.68	0.0000 0381	0.0000 0034	0.0000 0003		
2.69	0.0000 0469	0.0000 0043	0.0000 0004		
2.70	0.0000 0577	0.0000 0055	0.0000 0005	0.0000 0000	
2.71	0.0000 0709	0.0000 0070	0.0000 0007	0.0000 0001	
2.72	0.0000 0870	0.0000 0090	0.0000 0009	0.0000 0001	
2.73	0.0000 1067	0.0000 0114	0.0000 0012	0.0000 0001	
2.74	0.0000 1307	0.0000 0145	0.0000 0016	0.0000 0002	
2.75	0.0000 1600	0.0000 0184	0.0000 0021	0.0000 0002	
2.76	0.0000 1956	0.0000 0233	0.0000 0027	0.0000 0003	
2.77	0.0000 2390	0.0000 0295	0.0000 0036	0.0000 0004	0.0000 0000
2.78	0.0000 2917	0.0000 0374	0.0000 0047	0.0000 0006	0.0000 0001
2.79	0.0000 3557	0.0000 0472	0.0000 0062	0.0000 0008	0.0000 0001
2.80	0.0000 4333	0.0000 0596	0.0000 0080	0.0000 0011	0.0000 0001
2.81	0.0000 5273	0.0000 0752	0.0000 0105	0.0000 0015	0.0000 0002
2.82	0.0000 6411	0.0000 0947	0.0000 0137	0.0000 0020	0.0000 0003
2.83	0.0000 7788	0.0000 1191	0.0000 0179	0.0000 0027	0.0000 0004
2.84	0.0000 9451	0.0000 1497	0.0000 0233	0.0000 0036	0.0000 0005
2.85	0.0001 1459	0.0000 1880	0.0000 0303	0.0000 0048	0.0000 0008
2.86	0.0001 3880	0.0000 2358	0.0000 0393	0.0000 0065	0.0000 0011
2.87	0.0001 6797	0.0000 2954	0.0000 0510	0.0000 0087	0.0000 0015
2.88	0.0002 0308	0.0000 3697	0.0000 0661	0.0000 0117	0.0000 0020
2.89	0.0002 4528	0.0000 4622	0.0000 0856	0.0000 0156	0.0000 0028
2.90	0.0002 9598	0.0000 5772	0.0000 1106	0.0000 0209	0.0000 0039
2.91	0.0003 5680	0.0000 7201	0.0000 1428	0.0000 0279	0.0000 0054
2.92	0.0004 2972	0.0000 8973	0.0000 1841	0.0000 0372	0.0000 0075
2.93	0.0005 1704	0.0001 1169	0.0000 2370	0.0000 0496	0.0000 0103
2.94	0.0006 2150	0.0001 3887	0.0000 3049	0.0000 0660	0.0000 0141
2.95	0.0007 4633	0.0001 7248	0.0000 3917	0.0000 0877	0.0000 0194
2.96	0.0008 9535	0.0002 1398	0.0000 5025	0.0000 1164	0.0000 0267
2.97	0.0010 7306	0.0002 6518	0.0000 6440	0.0000 1543	0.0000 0366
2.98	0.0012 8477	0.0003 2826	0.0000 8242	0.0000 2042	0.0000 0500
2.99	0.0015 3671	0.0004 0588	0.0001 0536	0.0000 2698	0.0000 0684
3.00	0.0018 3619	0.0005 0130	0.0001 3452	0.0000 3561	0.0000 0933

W	P(W,60)	P(W,70)	P(W,80)	P(W,90)	P(W,100)
3.01	0.0021 9179	0.0006 1843	0.0001 7152	0.0000 4694	0.0000 1271
3.02	0.0026 1356	0.0007 6204	0.0002 1842	0.0000 6178	0.0000 1729
3.03	0.0031 1325	0.0009 3792	0.0002 7780	0.0000 8119	0.0000 2348
3.04	0.0037 0456	0.0011 5303	0.0003 5285	0.0001 0656	0.0000 3184
3.05	0.0044 0349	0.0014 1579	0.0004 4759	0.0001 3965	0.0000 4311
3.06	0.0052 2861	0.0017 3633	0.0005 6702	0.0001 8275	0.0000 5828
3.07	0.0062 0154	0.0021 2684	0.0007 1736	0.0002 3881	0.0000 7867
3.08	0.0073 4733	0.0026 0196	0.0009 0631	0.0003 1161	0.0001 0602
3.09	0.0086 9496	0.0031 7921	0.0011 4346	0.0004 0599	0.0001 4265
3.10	0.0102 7792	0.0038 7957	0.0014 4065	0.0005 2815	0.0001 9163
3.11	0.0121 3482	0.0047 2805	0.0018 1250	0.0006 8601	0.0002 5698
3.12	0.0143 1006	0.0057 5448	0.0022 7702	0.0008 8965	0.0003 4405
3.13	0.0168 5461	0.0069 9426	0.0028 5638	0.0011 5191	0.0004 5983
3.14	0.0198 2682	0.0084 8942	0.0035 7775	0.0014 8905	0.0006 1350
3.15	0.0232 9329	0.0102 8964	0.0044 7440	0.0019 2166	0.0008 1707
3.16	0.0273 2990	0.0124 5354	0.0055 8695	0.0024 7576	0.0010 8621
3.17	0.0320 2273	0.0150 5009	0.0069 6486	0.0031 8408	0.0014 4131
3.18	0.0374 6923	0.0181 6021	0.0086 6820	0.0040 8773	0.0019 0886
3.19	0.0437 7923	0.0218 7850	0.0107 6965	0.0052 3821	0.0025 2313
3.20	0.0510 7605	0.0263 1520	0.0133 5695	0.0066 9976	0.0033 2833
3.21	0.0594 9759	0.0315 9826	0.0165 3559	0.0085 5234	0.0043 8135
3.22	0.0691 9723	0.0378 7562	0.0204 3194	0.0108 9507	0.0057 5509
3.23	0.0803 4467	0.0453 1746	0.0251 9676	0.0138 5031	0.0075 4266
3.24	0.0931 2644	0.0541 1859	0.0310 0905	0.0175 6853	0.0098 6243
3.25	0.1077 4608	0.0645 0069	0.0380 8027	0.0222 3386	0.0128 6431
3.26	0.1244 2382	0.0767 1432	0.0466 5880	0.0280 7047	0.0167 3714
3.27	0.1433 9540	0.0910 4048	0.0570 3445	0.0353 4962	0.0217 1758
3.28	0.1649 1011	0.1077 9139	0.0695 4284	0.0443 9743	0.0281 0030
3.29	0.1892 2737	0.1273 1023	0.0845 6917	0.0556 0292	0.0362 4978
3.30	0.2166 1170	0.1499 6905	0.1025 5091	0.0694 2601	0.0466 1309
3.31	0.2473 2551	0.1761 6440	0.1239 7852	0.0864 0461	0.0597 3360
3.32	0.2816 1908	0.2063 0960	0.1493 9309	0.1071 5975	0.0762 6419
3.33	0.3197 1696	0.2408 2248	0.1793 7922	0.1323 9675	0.0969 7872
3.34	0.3617 9993	0.2801 0702	0.2145 5109	0.1629 0008	0.1227 7867
3.35	0.4079 8123	0.3245 2679	0.2555 2853	0.1995 1778	0.1546 9088
3.36	0.4582 7583	0.3743 6772	0.3028 9916	0.2431 3017	0.1938 4973
3.37	0.5125 6074	0.4297 8671	0.3571 6120	0.2945 9506	0.2414 5390
3.38	0.5705 2461	0.4907 4193	0.4186 3956	0.3546 5858	0.2986 8319
3.39	0.6316 0362	0.5568 9933	0.4873 6579	0.4238 1678	0.3665 5409
3.40	0.6949 0088	0.6275 0867	0.5629 0924	0.5021 0715	0.4456 8359
3.41	0.7590 8536	0.7012 4030	0.6441 4268	0.5888 0185	0.5359 1727
3.42	0.8222 6579	0.7759 7201	0.7289 2093	0.6819 6420	0.6357 5959
3.43	0.8818 3397	0.8485 1237	0.8136 4402	0.7778 1598	0.7415 1841
3.44	0.9342 7087	0.9142 4337	0.8926 6824	0.8698 4528	0.8460 4092
3.45	0.9749 0724	0.9666 6155	0.9575 1749	0.9475 6005	0.9368 6888
3.460	0.9976 2935	0.9967 9076	0.9958 3353	0.9947 6060	0.9935 7480
3.461	0.9986 2924	0.9981 4081	0.9975 8168	0.9969 5314	0.9962 5648
3.462	0.9993 6361	0.9991 3520	0.9988 7297	0.9985 7734	0.9982 4872
3.463	0.9998 2319	0.9997 5926	0.9996 8567	0.9996 0245	0.9995 0969
3.464	0.9999 9848	0.9999 9792	0.9999 9728	0.9999 9656	0.9999 9575

Table B3

PERCENTAGE POINTS OF THE RANGE W FOR SAMPLES OF n FROM $R(\mu, 1)$

[P = cumulative probability = Prob ($W \leq$ tabular value)]

PERCENTAGE POINTS OF THE RANGE

P \ n	2	3	4	5	6	7
0.0001	0.000173	0.020039	0.102048	0.234911	0.391335	0.553000
0.0005	0.000866	0.044916	0.175456	0.353873	0.544437	0.729418
0.0010	0.001732	0.063636	0.221835	0.422668	0.628340	0.822649
0.0050	0.008671	0.143414	0.384117	0.641196	0.879856	1.091498
0.0100	0.017364	0.204046	0.487979	0.769281	1.019532	1.235421
0.0250	0.043575	0.326662	0.672453	0.982357	1.242800	1.459346
0.0500	0.087713	0.468867	0.861192	1.186772	1.448675	1.660334
0.1000	0.177766	0.678271	1.110108	1.441446	1.696314	1.896371
0.2000	0.365715	0.994685	1.446423	1.766026	2.000700	2.179400
0.3000	0.565826	1.258361	1.702936	2.002222	2.215786	2.375394
0.4000	0.780820	1.499717	1.924308	2.199756	2.392155	2.533946
0.5000	1.014612	1.732051	2.127902	2.377031	2.548020	2.672589
0.6000	1.273211	1.964384	2.323835	2.544145	2.693050	2.800441
0.7000	1.566735	2.205741	2.520536	2.708834	2.834316	2.923976
0.8000	1.914908	2.469417	2.728614	2.880023	2.979541	3.050006
0.9000	2.368656	2.785830	2.970262	3.075308	3.143342	3.191049
0.9500	2.689505	2.995234	3.125966	3.199304	3.246383	3.279203
0.9750	2.916379	3.137439	3.229977	3.281388	3.314203	3.336995
0.9900	3.117691	3.260055	3.318614	3.350887	3.371391	3.385588
0.9950	3.219153	3.320687	3.362102	3.384839	3.399251	3.409215
0.9990	3.354557	3.400465	3.418989	3.429108	3.435504	3.439917
0.9995	3.386642	3.419186	3.432284	3.439431	3.443946	3.447059
0.9999	3.429461	3.444063	3.449921	3.453112	3.455126	3.456515

P \ n	8	9	10	11	12	13
0.0001	0.710259	0.858661	0.996538	1.123634	1.240378	1.347496
0.0005	0.901647	1.058999	1.201592	1.330456	1.446929	1.552377
0.0010	1.000168	1.160095	1.303461	1.431916	1.547209	1.650981
0.0050	1.276462	1.437708	1.578636	1.702382	1.811634	1.908634
0.0100	1.420483	1.579514	1.716973	1.836611	1.941478	2.034029
0.0250	1.640219	1.792685	1.922521	2.034190	2.131129	2.215995
0.0500	1.833620	1.977532	2.098680	2.201923	2.290877	2.368269
0.1000	2.056826	2.188057	2.297227	2.389387	2.468180	2.536292
0.2000	2.319684	2.432597	2.525371	2.602919	2.668685	2.725154
0.3000	2.499043	2.597588	2.677938	2.744690	2.801019	2.849184
0.4000	2.642707	2.728747	2.798499	2.856182	2.904674	2.946009
0.5000	2.767363	2.841881	2.902007	2.951541	2.993055	3.028350
0.6000	2.881563	2.945007	2.995986	3.037845	3.072831	3.102508
0.7000	2.991258	3.043619	3.085531	3.119840	3.148444	3.172657
0.8000	3.102544	3.143233	3.175681	3.202163	3.224187	3.242793
0.9000	3.226374	3.253591	3.275209	3.292795	3.307383	3.319680
0.9500	3.303404	3.321993	3.336722	3.348680	3.358585	3.366922
0.9750	3.353756	3.366605	3.376769	3.385012	3.391832	3.397568
0.9900	3.396005	3.403977	3.410276	3.415379	3.419597	3.423142
0.9950	3.416519	3.422104	3.426514	3.430085	3.433036	3.435515
0.9990	3.443147	3.445615	3.447562	3.449138	3.450439	3.451532
0.9995	3.449338	3.451078	3.452451	3.453561	3.454478	3.455248
0.9999	3.457530	3.458306	3.458917	3.459412	3.459820	3.460163

PERCENTAGE POINTS OF THE RANGE

P\n	14	15	16	17	18	19
0.0001	1.445820	1.536183	1.619372	1.696111	1.767053	1.832778
0.0005	1.648078	1.735184	1.814706	1.887527	1.954413	2.016028
0.0010	1.744701	1.829645	1.906912	1.977443	2.042044	2.101406
0.0050	1.995231	2.072946	2.143034	2.206534	2.264314	2.317096
0.0100	2.116235	2.189691	2.255690	2.315290	2.369363	2.418632
0.0250	2.290864	2.357375	2.416832	2.470288	2.518597	2.562463
0.0500	2.436184	2.496245	2.549726	2.597645	2.640820	2.679918
0.1000	2.595739	2.648067	2.694475	2.735909	2.773126	2.806734
0.2000	2.774161	2.817088	2.854998	2.888720	2.918910	2.946095
0.3000	2.890836	2.927211	2.959250	2.987685	3.013090	3.035926
0.4000	2.981660	3.012723	3.040031	3.064225	3.085808	3.105182
0.5000	3.058725	3.085142	3.108328	3.128840	3.147117	3.163504
0.6000	3.128001	3.150135	3.169534	3.186675	3.201930	3.215595
0.7000	3.193418	3.211418	3.227172	3.241077	3.253439	3.264503
0.8000	3.258719	3.272505	3.284557	3.295181	3.304618	3.313056
0.9000	3.330186	3.339266	3.347192	3.354172	3.360365	3.365897
0.9500	3.374037	3.380181	3.385540	3.390255	3.394436	3.398169
0.9750	3.402460	3.406681	3.410361	3.413597	3.416466	3.419026
0.9900	3.426164	3.428771	3.431042	3.433038	3.434807	3.436386
0.9950	3.437628	3.439449	3.441036	3.442431	3.443667	3.444769
0.9990	3.452463	3.453265	3.453964	3.454578	3.455122	3.455607
0.9995	3.455904	3.456470	3.456962	3.457395	3.457778	3.458120
0.9999	3.460455	3.460707	3.460926	3.461118	3.461289	3.461441

P\n	20	22	24	26	28	30
0.0001	1.893805	2.003546	2.099345	2.183619	2.258275	2.324839
0.0005	2.072945	2.174619	2.262704	2.339698	2.407538	2.467744
0.0010	2.156120	2.253577	2.337728	2.411080	2.475560	2.532667
0.0050	2.365490	2.451110	2.524464	2.587988	2.643520	2.692469
0.0100	2.463702	2.543203	2.611082	2.669697	2.720812	2.765774
0.0250	2.602466	2.672747	2.732478	2.783857	2.828517	2.867689
0.0500	2.715488	2.777786	2.830544	2.875789	2.915017	2.949350
0.1000	2.837234	2.890483	2.935410	2.973822	3.007037	3.036043
0.2000	2.970701	3.013517	3.049502	3.080169	3.106614	3.129653
0.3000	3.056562	3.092395	3.122438	3.147991	3.169988	3.189125
0.4000	3.122668	3.152985	3.178358	3.199906	3.218432	3.234531
0.5000	3.178280	3.203864	3.225246	3.243380	3.258956	3.272478
0.6000	3.227906	3.249199	3.266970	3.282026	3.294945	3.306153
0.7000	3.274462	3.291670	3.306014	3.318154	3.328563	3.337586
0.8000	3.320646	3.333746	3.344653	3.353875	3.361775	3.368619
0.9000	3.370868	3.379440	3.386568	3.392589	3.397742	3.402202
0.9500	3.401522	3.407299	3.412099	3.416151	3.419617	3.422616
0.9750	3.421325	3.425284	3.428573	3.431347	3.433720	3.435772
0.9900	3.437803	3.440242	3.442267	3.443976	3.445436	3.446698
0.9950	3.445759	3.447462	3.448876	3.450068	3.451087	3.451968
0.9990	3.456043	3.456792	3.457414	3.457938	3.458386	3.458774
0.9995	3.458427	3.458954	3.459392	3.459762	3.460077	3.460350
0.9999	3.461577	3.461812	3.462007	3.462171	3.462312	3.462433

PERCENTAGE POINTS OF THE RANGE

P\n	32	34	36	38	40	50
0.0001	2.384535	2.438357	2.487122	2.531503	2.572058	2.731610
0.0005	2.521520	2.569834	2.613471	2.653075	2.689175	2.830392
0.0010	2.583586	2.629264	2.670463	2.707809	2.741814	2.874506
0.0050	2.735934	2.774783	2.809711	2.841282	2.869955	2.981192
0.0100	2.805626	2.841189	2.873118	2.901942	2.928091	3.029275
0.0250	2.902325	2.933167	2.960805	2.985713	3.008275	3.095280
0.0500	2.979649	3.006584	3.030686	3.052379	3.072006	3.147489
0.1000	3.061590	3.084262	3.104519	3.122726	3.139179	3.202283
0.2000	3.149904	3.167844	3.183846	3.198209	3.211172	3.260746
0.3000	3.205923	3.220788	3.234035	3.245914	3.256627	3.297523
0.4000	3.248649	3.261132	3.272248	3.282210	3.291188	3.325417
0.5000	3.284328	3.294798	3.304115	3.312460	3.319978	3.348608
0.6000	3.315967	3.324634	3.332342	3.339243	3.345456	3.369097
0.7000	3.345482	3.352451	3.358646	3.364190	3.369180	3.388147
0.8000	3.374604	3.379883	3.384574	3.388770	3.392546	3.406883
0.9000	3.406100	3.409536	3.412588	3.415317	3.417771	3.427081
0.9500	3.425236	3.427545	3.429594	3.431427	3.433074	3.439320
0.9750	3.437564	3.439143	3.440545	3.441797	3.442923	3.447192
0.9900	3.447801	3.448772	3.449634	3.450405	3.451097	3.453721
0.9950	3.452737	3.453415	3.454016	3.454554	3.455036	3.456866
0.9990	3.459112	3.459409	3.459674	3.459910	3.460122	3.460926
0.9995	3.460588	3.460798	3.460984	3.461150	3.461300	3.461866
0.9999	3.462539	3.462632	3.462715	3.462789	3.462856	3.463107

P\n	60	70	80	90	100	
0.0001	2.842924	2.924944	2.987868	3.037659	3.078035	
0.0005	2.928185	2.999877	3.054674	3.097913	3.132898	
0.0010	2.966099	3.033098	3.084225	3.124518	3.157089	
0.0050	3.057391	3.112840	3.154993	3.188117	3.214833	
0.0100	3.098356	3.148511	3.186575	3.216449	3.240519	
0.0250	3.154414	3.197214	3.229624	3.255017	3.275449	
0.0500	3.198613	3.235527	3.263431	3.285264	3.302814	
0.1000	3.244868	3.275540	3.298685	3.316769	3.331290	
0.2000	3.294075	3.318018	3.336050	3.350121	3.361405	
0.3000	3.324953	3.344627	3.359426	3.370964	3.380211	
0.4000	3.348334	3.364751	3.377091	3.386704	3.394404	
0.5000	3.367748	3.381446	3.391734	3.399745	3.406159	
0.6000	3.384882	3.396169	3.404640	3.411234	3.416510	
0.7000	3.400796	3.409834	3.416613	3.421887	3.426107	
0.8000	3.416434	3.423253	3.428365	3.432340	3.435519	
0.9000	3.433276	3.437695	3.441005	3.443578	3.445636	
0.9500	3.443473	3.446434	3.448651	3.450374	3.451752	
0.9750	3.450028	3.452050	3.453564	3.454739	3.455679	
0.9900	3.455463	3.456705	3.457634	3.458356	3.458933	
0.9950	3.458081	3.458947	3.459595	3.460098	3.460500	
0.9990	3.461459	3.461839	3.462124	3.462345	3.462521	
0.9995	3.462241	3.462509	3.462709	3.462865	3.462989	
0.9999	3.463274	3.463393	3.463483	3.463552	3.463607	

Table B4

COEFFICIENTS OF SAMPLE RANGE w IN EXACT LOWER CONFIDENCE BOUNDS FOR STANDARD DEVIATION σ OF RECTANGULAR POPULATION

[P = confidence level; n = sample size]

COEFFICIENTS OF w IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P\n	2	3	4	5	6	7
0.0001	5773.358	49.90350	9.799300	4.256924	2.555358	1.808319
0.0005	1154.556	22.26383	5.699450	2.825874	1.836760	1.370956
0.0010	577.2059	15.71427	4.507863	2.365921	1.591495	1.215585
0.0050	115.3255	6.972804	2.603374	1.559586	1.136549	0.916172
0.0100	57.59033	4.900845	2.049266	1.299915	0.980842	0.809440
0.0250	22.94876	3.061264	1.487093	1.017960	0.804635	0.685239
0.0500	11.40082	2.132799	1.161182	0.842622	0.690286	0.602289
0.1000	5.625364	1.474336	0.900813	0.693748	0.589513	0.527323
0.2000	2.734370	1.005344	0.691361	0.566243	0.499825	0.458842
0.3000	1.767327	0.794685	0.587221	0.499445	0.451307	0.420983
0.4000	1.280705	0.666792	0.519667	0.454596	0.418033	0.394641
0.5000	0.985599	0.577350	0.469946	0.420693	0.392462	0.374169
0.6000	0.785416	0.509065	0.430323	0.393059	0.371326	0.357087
0.7000	0.638270	0.453362	0.396741	0.369162	0.352819	0.342000
0.8000	0.522218	0.404954	0.366486	0.347219	0.335622	0.327868
0.9000	0.422180	0.358959	0.336671	0.325171	0.318133	0.313377
0.9500	0.371816	0.333864	0.319901	0.312568	0.308035	0.304952
0.9750	0.342891	0.318731	0.309600	0.304749	0.301732	0.299671
0.9900	0.320750	0.306743	0.301331	0.298428	0.296613	0.295370
0.9950	0.310641	0.301142	0.297433	0.295435	0.294182	0.293323
0.9990	0.298102	0.294077	0.292484	0.291621	0.291078	0.290705
0.9995	0.295278	0.292467	0.291351	0.290746	0.290365	0.290102
0.9999	0.291591	0.290355	0.289862	0.289594	0.289425	0.289309

P\n	8	9	10	11	12	13
0.0001	1.407938	1.164604	1.003474	0.889969	0.806206	0.742117
0.0005	1.109082	0.944288	0.832229	0.751622	0.691119	0.644174
0.0010	0.999832	0.861999	0.767188	0.698365	0.646325	0.605700
0.0050	0.783415	0.695552	0.633458	0.587412	0.551988	0.523935
0.0100	0.703986	0.633106	0.582420	0.544481	0.515071	0.491635
0.0250	0.609675	0.557823	0.520150	0.491596	0.469235	0.451265
0.0500	0.545369	0.505681	0.476490	0.454148	0.436514	0.422249
0.1000	0.486186	0.457026	0.435307	0.418517	0.405157	0.394276
0.2000	0.431093	0.411083	0.395981	0.384184	0.374716	0.366952
0.3000	0.400153	0.384973	0.373422	0.364340	0.357013	0.350978
0.4000	0.378400	0.366469	0.357334	0.350118	0.344273	0.339442
0.5000	0.361355	0.351880	0.344589	0.338806	0.334107	0.330213
0.6000	0.347034	0.339558	0.333780	0.329181	0.325433	0.322320
0.7000	0.334307	0.328556	0.324093	0.320529	0.317617	0.315193
0.8000	0.322316	0.318144	0.314893	0.312289	0.310156	0.308376
0.9000	0.309945	0.307353	0.305324	0.303693	0.302354	0.301234
0.9500	0.302718	0.301024	0.299695	0.298625	0.297744	0.297007
0.9750	0.298173	0.297035	0.296141	0.295420	0.294826	0.294328
0.9900	0.294464	0.293774	0.293231	0.292793	0.292432	0.292129
0.9950	0.292696	0.292218	0.291842	0.291538	0.291287	0.291077
0.9990	0.290432	0.290224	0.290060	0.289928	0.289818	0.289726
0.9995	0.289911	0.289765	0.289649	0.289556	0.289479	0.289415
0.9999	0.289224	0.289159	0.289108	0.289066	0.289032	0.289004

COEFFICIENTS OF w IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P \ n	14	15	16	17	18	19
0.0001	0.691649	0.650964	0.617523	0.589584	0.565914	0.545620
0.0005	0.606767	0.576308	0.551054	0.529794	0.511663	0.496025
0.0010	0.573164	0.546554	0.524408	0.505704	0.489705	0.475872
0.0050	0.501195	0.482405	0.466628	0.453199	0.441635	0.431575
0.0100	0.472537	0.456685	0.443323	0.431911	0.422054	0.413457
0.0250	0.436517	0.424201	0.413765	0.404811	0.397046	0.390250
0.0500	0.410478	0.400602	0.392199	0.384964	0.378670	0.373146
0.1000	0.385247	0.377634	0.371130	0.365509	0.360604	0.356286
0.2000	0.360469	0.354977	0.350263	0.346174	0.342594	0.339432
0.3000	0.345921	0.341622	0.337923	0.334707	0.331885	0.329389
0.4000	0.335384	0.331926	0.328944	0.326347	0.324064	0.322042
0.5000	0.326934	0.324134	0.321716	0.319607	0.317751	0.316105
0.6000	0.319693	0.317447	0.315504	0.313807	0.312312	0.310984
0.7000	0.313144	0.311389	0.309869	0.308539	0.307367	0.306325
0.8000	0.306869	0.305576	0.304455	0.303473	0.302607	0.301836
0.9000	0.300284	0.299467	0.298758	0.298136	0.297587	0.297098
0.9500	0.296381	0.295842	0.295374	0.294963	0.294600	0.294276
0.9750	0.293905	0.293541	0.293224	0.292946	0.292700	0.292481
0.9900	0.291872	0.291650	0.291457	0.291287	0.291137	0.291003
0.9950	0.290898	0.290744	0.290610	0.290492	0.290388	0.290295
0.9990	0.289648	0.289581	0.289522	0.289471	0.289425	0.289385
0.9995	0.289360	0.289313	0.289271	0.289235	0.289203	0.289174
0.9999	0.288979	0.288958	0.288940	0.288924	0.288910	0.288897

P \ n	20	22	24	26	28	30
0.0001	0.528037	0.499115	0.476339	0.457955	0.442816	0.430137
0.0005	0.482405	0.459851	0.441949	0.427406	0.415362	0.405229
0.0010	0.463796	0.443739	0.427766	0.414752	0.403949	0.394841
0.0050	0.422745	0.407978	0.396124	0.386400	0.378283	0.371406
0.0100	0.405893	0.393205	0.382983	0.374574	0.367537	0.361562
0.0250	0.384251	0.374147	0.365968	0.359214	0.353542	0.348713
0.0500	0.368258	0.359999	0.353289	0.347731	0.343051	0.339058
0.1000	0.352456	0.345963	0.340668	0.336268	0.332553	0.329376
0.2000	0.336621	0.331838	0.327922	0.324658	0.321894	0.319524
0.3000	0.327165	0.323374	0.320263	0.317663	0.315459	0.313566
0.4000	0.320239	0.317160	0.314628	0.312509	0.310710	0.309164
0.5000	0.314636	0.312123	0.310054	0.308320	0.306847	0.305579
0.6000	0.309798	0.307768	0.306094	0.304690	0.303495	0.302466
0.7000	0.305394	0.303797	0.302479	0.301372	0.300430	0.299618
0.8000	0.301146	0.299963	0.298985	0.298163	0.297462	0.296858
0.9000	0.296659	0.295907	0.295284	0.294760	0.294313	0.293927
0.9500	0.293986	0.293488	0.293075	0.292727	0.292430	0.292174
0.9750	0.292284	0.291947	0.291667	0.291431	0.291229	0.291055
0.9900	0.290883	0.290677	0.290506	0.290362	0.290239	0.290133
0.9950	0.290212	0.290068	0.289950	0.289849	0.289764	0.289690
0.9990	0.289348	0.289286	0.289234	0.289190	0.289152	0.289120
0.9995	0.289149	0.289105	0.289068	0.289037	0.289011	0.288988
0.9999	0.288886	0.288866	0.288850	0.288836	0.288824	0.288814

COEFFICIENTS OF w IN EXACT LOWER CONFIDENCE BOUNDS FOR σ

P\n	32	34	36	38	40	50
0.0001	0.419369	0.410112	0.402071	0.395022	0.388794	0.366084
0.0005	0.396586	0.389130	0.382633	0.376921	0.371861	0.353308
0.0010	0.387059	0.380335	0.374467	0.369302	0.364722	0.347886
0.0050	0.365506	0.360389	0.355908	0.351954	0.348438	0.335436
0.0100	0.356427	0.351965	0.348054	0.344597	0.341519	0.330112
0.0250	0.344551	0.340928	0.337746	0.334928	0.332416	0.323073
0.0500	0.335610	0.332603	0.329958	0.327613	0.325520	0.317714
0.1000	0.326628	0.324227	0.322111	0.320233	0.318555	0.312277
0.2000	0.317470	0.315672	0.314086	0.312675	0.311413	0.306678
0.3000	0.311923	0.310483	0.309211	0.308080	0.307066	0.303258
0.4000	0.307820	0.306642	0.305600	0.304673	0.303842	0.300714
0.5000	0.304476	0.303509	0.302653	0.301890	0.301207	0.298632
0.6000	0.301571	0.300785	0.300089	0.299469	0.298913	0.296815
0.7000	0.298911	0.298289	0.297739	0.297248	0.296808	0.295147
0.8000	0.296331	0.295868	0.295458	0.295092	0.294764	0.293523
0.9000	0.293591	0.293295	0.293033	0.292799	0.292588	0.291793
0.9500	0.291951	0.291754	0.291580	0.291424	0.291284	0.290755
0.9750	0.290904	0.290770	0.290652	0.290546	0.290451	0.290091
0.9900	0.290040	0.289958	0.289886	0.289821	0.289763	0.289543
0.9950	0.289625	0.289568	0.289518	0.289473	0.289433	0.289279
0.9990	0.289092	0.289067	0.289045	0.289025	0.289007	0.288940
0.9995	0.288968	0.288951	0.288935	0.288921	0.288909	0.288862
0.9999	0.288805	0.288798	0.288791	0.288785	0.288779	0.288758

P\n	60	70	80	90	100	
0.0001	0.351751	0.341887	0.334687	0.329201	0.324883	
0.0005	0.341509	0.333347	0.327367	0.322798	0.319193	
0.0010	0.337143	0.329696	0.324231	0.320049	0.316747	
0.0050	0.327076	0.321250	0.316958	0.313665	0.311058	
0.0100	0.322752	0.317610	0.313817	0.310902	0.308593	
0.0250	0.317016	0.312772	0.309634	0.307218	0.305302	
0.0500	0.312636	0.309069	0.306426	0.304390	0.302772	
0.1000	0.308179	0.305293	0.303151	0.301498	0.300184	
0.2000	0.303575	0.301385	0.299756	0.298497	0.297495	
0.3000	0.300756	0.298987	0.297670	0.296651	0.295840	
0.4000	0.298656	0.297199	0.296113	0.295272	0.294603	
0.5000	0.296934	0.295731	0.294834	0.294140	0.293586	
0.6000	0.295431	0.294449	0.293717	0.293149	0.292696	
0.7000	0.294049	0.293269	0.292687	0.292236	0.291877	
0.8000	0.292703	0.292120	0.291684	0.291346	0.291077	
0.9000	0.291267	0.290893	0.290613	0.290396	0.290222	
0.9500	0.290404	0.290155	0.289968	0.289824	0.289708	
0.9750	0.289853	0.289683	0.289556	0.289457	0.289379	
0.9900	0.289397	0.289293	0.289215	0.289155	0.289106	
0.9950	0.289178	0.289105	0.289051	0.289009	0.288976	
0.9990	0.288896	0.288864	0.288840	0.288822	0.288807	
0.9995	0.288830	0.288808	0.288791	0.288778	0.288768	
0.9999	0.288744	0.288734	0.288727	0.288721	0.288716	

Appendix C

TABLES OF EXPECTED VALUES OF ORDER STATISTICS OF SAMPLES FROM VARIOUS POPULATIONS

SOURCES OF TABLES

Table C1	ARL TR 60–292 (Harter)
Table C2–C5	ARL 64–31 (Harter) [In Table C4, *values for* M = 1, ALPHA = 0.5 have been freshly recomputed (Harter)]

Table C1

EXPECTED VALUES OF NORMAL ORDER STATISTICS

$$E(x_{k|n}) = \frac{n!}{(n-k)!(k-1)!} \int_{-\infty}^{\infty} x\left[\frac{1}{2} - \Phi(x)\right]^{k-1}\left[\frac{1}{2} + \Phi(x)\right]^{n-k} \phi(x)\,dx,$$

where $\phi(x) = (2\pi)^{-1/2} e - x^{2/2}$ and $\Phi(x) = \int_0^x \phi(x)\,dx$.

[Tabular values are the expected values of the kth largest normal deviate for a sample of size n from $N(0, 1)$; or when preceded by a minus sign, they are the expected values of the kth smallest normal deviate.]

A. EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	2	3	4	5	6	7	8
1	0.56419	0.84628	1.02938	1.16296	1.26721	1.35218	1.42360
2		0.00000	0.29701	0.49502	0.64176	0.75737	0.85222
3				0.00000	0.20155	0.35271	0.47282
4						0.00000	0.15251

k \ n	9	10	11	12	13	14	15
1	1.48501	1.53875	1.58644	1.62923	1.66799	1.70338	1.73591
2	0.93230	1.00136	1.06192	1.11573	1.16408	1.20790	1.24794
3	0.57197	0.65606	0.72884	0.79284	0.84983	0.90113	0.94769
4	0.27453	0.37576	0.46198	0.53684	0.60285	0.66176	0.71488
5	0.00000	0.12267	0.22489	0.31225	0.38833	0.45557	0.51570
6			0.00000	0.10259	0.19052	0.26730	0.33530
7					0.00000	0.08816	0.16530
8							0.00000

k \ n	16	17	18	19	20	21	22
1	1.76599	1.79394	1.82003	1.84448	1.86748	1.88917	1.90969
2	1.28474	1.31878	1.35041	1.37994	1.40760	1.43362	1.45816
3	0.99027	1.02946	1.06573	1.09945	1.13095	1.16047	1.18824
4	0.76317	0.80738	0.84812	0.88586	0.92098	0.95380	0.98459
5	0.57001	0.61946	0.66479	0.70661	0.74538	0.78150	0.81527
6	0.39622	0.45133	0.50158	0.54771	0.59030	0.62982	0.66667
7	0.23375	0.29519	0.35084	0.40164	0.44833	0.49148	0.53157
8	0.07729	0.14599	0.20774	0.26374	0.31493	0.36203	0.40559
9		0.00000	0.06880	0.13072	0.18696	0.23841	0.28579
10				0.00000	0.06200	0.11836	0.16997
11						0.00000	0.05642

k \ n	23	24	25	26	27	28	29
1	1.92916	1.94767	1.96531	1.98216	1.99827	2.01371	2.02852
2	1.48137	1.50338	1.52430	1.54423	1.56326	1.58145	1.59888
3	1.21445	1.23924	1.26275	1.28511	1.30641	1.32674	1.34619
4	1.01356	1.04091	1.06679	1.09135	1.11471	1.13697	1.15822
5	0.84697	0.87682	0.90501	0.93171	0.95705	0.98115	1.00414
6	0.70115	0.73354	0.76405	0.79289	0.82021	0.84615	0.87084
7	0.56896	0.60399	0.63690	0.66794	0.69727	0.72508	0.75150
8	0.44609	0.48391	0.51935	0.55267	0.58411	0.61385	0.64205
9	0.32965	0.37047	0.40860	0.44436	0.47801	0.50977	0.53982
10	0.21755	0.26163	0.30268	0.34105	0.37706	0.41096	0.44298
11	0.10813	0.15583	0.20006	0.24128	0.27983	0.31603	0.35013
12	0.00000	0.05176	0.09953	0.14387	0.18520	0.22389	0.26023
13			0.00000	0.04781	0.09220	0.13361	0.17240
14					0.00000	0.04442	0.08588
15							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	30	31	32	33	34	35	36
1	2.04276	2.05646	2.06967	2.08241	2.09471	2.10661	2.11812
2	1.61560	1.63166	1.64712	1.66200	1.67636	1.69023	1.70362
3	1.36481	1.38268	1.39985	1.41637	1.43228	1.44762	1.46244
4	1.17855	1.19803	1.21672	1.23468	1.25196	1.26860	1.28466
5	1.02609	1.04709	1.06721	1.08652	1.10509	1.12295	1.14016
6	0.89439	0.91688	0.93841	0.95905	0.97886	0.99790	1.01624
7	0.77666	0.80066	0.82359	0.84555	0.86660	0.88681	0.90625
8	0.66885	0.69438	0.71875	0.74204	0.76435	0.78574	0.80629
9	0.56834	0.59545	0.62129	0.64596	0.66954	0.69214	0.71382
10	0.47329	0.50206	0.52943	0.55552	0.58043	0.60427	0.62710
11	0.38235	0.41287	0.44185	0.46942	0.49572	0.52084	0.54488
12	0.29449	0.32686	0.35755	0.38669	0.41444	0.44091	0.46620
13	0.20885	0.24322	0.27573	0.30654	0.33582	0.36371	0.39032
14	0.12473	0.16126	0.19572	0.22832	0.25924	0.28863	0.31663
15	0.04148	0.08037	0.11695	0.15147	0.18415	0.21515	0.24463
16		0.00000	0.03890	0.07552	0.11009	0.14282	0.17388
17				0.00000	0.03663	0.07123	0.10399
18						0.00000	0.03461

k \ n	37	38	39	40	41	42	43
1	2.12928	2.14009	2.15059	2.16078	2.17068	2.18032	2.18969
2	1.71659	1.72914	1.74131	1.75312	1.76458	1.77571	1.78654
3	1.47676	1.49061	1.50402	1.51702	1.52964	1.54188	1.55377
4	1.30016	1.31514	1.32964	1.34368	1.35728	1.37048	1.38329
5	1.15677	1.17280	1.18830	1.20330	1.21782	1.23190	1.24556
6	1.03390	1.05095	1.06741	1.08332	1.09872	1.11364	1.12810
7	0.92496	0.94300	0.96041	0.97722	0.99348	1.00922	1.02446
8	0.82605	0.84508	0.86343	0.88114	0.89825	0.91480	0.93082
9	0.73465	0.75468	0.77398	0.79259	0.81056	0.82792	0.84472
10	0.64902	0.67009	0.69035	0.70988	0.72871	0.74690	0.76448
11	0.56793	0.59005	0.61131	0.63177	0.65149	0.67052	0.68889
12	0.49042	0.51363	0.53592	0.55736	0.57799	0.59788	0.61707
13	0.41576	0.44012	0.46348	0.48591	0.50749	0.52827	0.54830
14	0.34336	0.36892	0.39340	0.41688	0.43944	0.46114	0.48204
15	0.27272	0.29954	0.32520	0.34978	0.37337	0.39604	0.41784
16	0.20342	0.23159	0.25849	0.28423	0.30890	0.33257	0.35533
17	0.13509	0.16469	0.19292	0.21988	0.24569	0.27043	0.29418
18	0.06739	0.09853	0.12817	0.15644	0.18345	0.20931	0.23411
19	0.00000	0.03280	0.06395	0.09362	0.12192	0.14897	0.17488
20			0.00000	0.03117	0.06085	0.08917	0.11625
21					0.00000	0.02969	0.05803
22							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	44	45	46	47	48	49	50
1	2.19882	2.20772	2.21639	2.22486	2.23312	2.24119	2.24907
2	1.79707	1.80733	1.81732	1.82706	1.83655	1.84582	1.85487
3	1.56533	1.57658	1.58754	1.59820	1.60860	1.61874	1.62863
4	1.39574	1.40784	1.41962	1.43108	1.44224	1.45312	1.46374
5	1.25881	1.27170	1.28422	1.29641	1.30827	1.31983	1.33109
6	1.14213	1.15576	1.16899	1.18186	1.19439	1.20658	1.21846
7	1.03924	1.05358	1.06751	1.08104	1.09420	1.10701	1.11948
8	0.94634	0.96139	0.97599	0.99018	1.00396	1.01737	1.03042
9	0.86097	0.87673	0.89201	0.90684	0.92125	0.93525	0.94887
10	0.78148	0.79795	0.81391	0.82939	0.84442	0.85902	0.87321
11	0.70666	0.72385	0.74049	0.75663	0.77228	0.78748	0.80225
12	0.63561	0.65353	0.67088	0.68768	0.70397	0.71978	0.73513
13	0.56763	0.58631	0.60438	0.62186	0.63881	0.65523	0.67117
14	0.50220	0.52166	0.54046	0.55865	0.57625	0.59331	0.60986
15	0.43885	0.45912	0.47868	0.49759	0.51588	0.53360	0.55077
16	0.37723	0.39833	0.41868	0.43834	0.45734	0.47573	0.49354
17	0.31701	0.33898	0.36016	0.38060	0.40034	0.41942	0.43789
18	0.25792	0.28081	0.30285	0.32410	0.34460	0.36441	0.38357
19	0.19972	0.22358	0.24652	0.26862	0.28992	0.31049	0.33036
20	0.14219	0.16707	0.19097	0.21396	0.23610	0.25746	0.27807
21	0.08513	0.11109	0.13600	0.15993	0.18296	0.20514	0.22653
22	0.02835	0.05546	0.08144	0.10637	0.13033	0.15338	0.17559
23		0.00000	0.02712	0.05311	0.07805	0.10203	0.12511
24				0.00000	0.02599	0.05095	0.07494
25						0.00000	0.02496

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	51	52	53	54	55	56	57
1	2.25678	2.26432	2.27169	2.27891	2.28598	2.29291	2.29970
2	1.86371	1.87235	1.88080	1.88906	1.89715	1.90506	1.91282
3	1.63829	1.64773	1.65695	1.66596	1.67478	1.68340	1.69185
4	1.47409	1.48420	1.49407	1.50372	1.51315	1.52237	1.53140
5	1.34207	1.35279	1.36326	1.37348	1.38346	1.39323	1.40278
6	1.23003	1.24132	1.25234	1.26310	1.27361	1.28387	1.29391
7	1.13162	1.14347	1.15502	1.16629	1.17729	1.18804	1.19855
8	1.04312	1.05550	1.06757	1.07934	1.09083	1.10205	1.11300
9	0.96213	0.97504	0.98762	0.99988	1.01185	1.02352	1.03493
10	0.88701	0.90045	0.91354	0.92629	0.93873	0.95086	0.96271
11	0.81661	0.83058	0.84417	0.85742	0.87033	0.88292	0.89520
12	0.75004	0.76455	0.77866	0.79240	0.80578	0.81883	0.83155
13	0.68666	0.70170	0.71633	0.73057	0.74444	0.75794	0.77111
14	0.62592	0.64152	0.65668	0.67143	0.68578	0.69976	0.71337
15	0.56742	0.58358	0.59928	0.61455	0.62940	0.64385	0.65793
16	0.51080	0.52755	0.54380	0.55960	0.57495	0.58989	0.60444
17	0.45578	0.47312	0.48995	0.50629	0.52217	0.53761	0.55263
18	0.40211	0.42007	0.43749	0.45439	0.47080	0.48675	0.50226
19	0.34957	0.36818	0.38621	0.40369	0.42065	0.43713	0.45314
20	0.29799	0.31726	0.33592	0.35400	0.37154	0.38856	0.40510
21	0.24719	0.26716	0.28648	0.30518	0.32331	0.34090	0.35797
22	0.19702	0.21772	0.23772	0.25708	0.27583	0.29400	0.31163
23	0.14735	0.16880	0.18953	0.20957	0.22896	0.24774	0.26595
24	0.09803	0.12029	0.14177	0.16252	0.18259	0.20201	0.22082
25	0.04896	0.07206	0.09434	0.11584	0.13661	0.15669	0.17614
26	0.00000	0.02400	0.04712	0.06940	0.09091	0.11170	0.13180
27			0.00000	0.02312	0.04541	0.06693	0.08773
28					0.00000	0.02229	0.04382
29							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	58	59	60	61	62	63	64
1	2.30635	2.31288	2.31928	2.32556	2.33173	2.33778	2.34373
2	1.92041	1.92786	1.93516	1.94232	1.94934	1.95624	1.96301
3	1.70012	1.70822	1.71616	1.72394	1.73158	1.73906	1.74641
4	1.54024	1.54889	1.55736	1.56567	1.57381	1.58180	1.58963
5	1.41212	1.42127	1.43023	1.43900	1.44760	1.45603	1.46430
6	1.30373	1.31334	1.32274	1.33195	1.34097	1.34982	1.35848
7	1.20882	1.21886	1.22869	1.23832	1.24774	1.25698	1.26603
8	1.12371	1.13419	1.14443	1.15445	1.16427	1.17388	1.18329
9	1.04607	1.05695	1.06760	1.07802	1.08821	1.09819	1.10797
10	0.97427	0.98557	0.99662	1.00742	1.01799	1.02833	1.03846
11	0.90719	0.91890	0.93034	0.94153	0.95247	0.96317	0.97365
12	0.84397	0.85609	0.86793	0.87950	0.89081	0.90187	0.91270
13	0.78396	0.79649	0.80873	0.82068	0.83237	0.84379	0.85496
14	0.72665	0.73960	0.75224	0.76459	0.77665	0.78843	0.79996
15	0.67164	0.68502	0.69807	0.71081	0.72324	0.73540	0.74727
16	0.61860	0.63241	0.64587	0.65901	0.67183	0.68436	0.69659
17	0.56725	0.58150	0.59538	0.60893	0.62214	0.63504	0.64764
18	0.51736	0.53205	0.54637	0.56033	0.57395	0.58723	0.60020
19	0.46872	0.48388	0.49864	0.51303	0.52705	0.54073	0.55408
20	0.42117	0.43681	0.45202	0.46685	0.48129	0.49537	0.50911
21	0.37456	0.39068	0.40637	0.42164	0.43652	0.45101	0.46515
22	0.32875	0.34538	0.36155	0.37729	0.39260	0.40752	0.42207
23	0.28362	0.30078	0.31745	0.33366	0.34944	0.36480	0.37976
24	0.23906	0.25677	0.27396	0.29066	0.30691	0.32272	0.33812
25	0.19498	0.21325	0.23098	0.24820	0.26494	0.28122	0.29706
26	0.15127	0.17013	0.18842	0.20618	0.22343	0.24019	0.25650
27	0.10785	0.12733	0.14621	0.16452	0.18230	0.19957	0.21636
28	0.06463	0.08476	0.10425	0.12315	0.14148	0.15927	0.17656
29	0.02153	0.04234	0.06248	0.08198	0.10089	0.11923	0.13704
30		0.00000	0.02081	0.04096	0.06047	0.07938	0.09774
31				0.00000	0.02014	0.03966	0.05858
32						0.00000	0.01952

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	65	66	67	68	69	70	71
1	2.34958	2.35532	2.36097	2.36652	2.37199	2.37736	2.38265
2	1.96965	1.97618	1.98260	1.98891	1.99510	2.00120	2.00720
3	1.75363	1.76071	1.76767	1.77451	1.78122	1.78783	1.79432
4	1.59732	1.60487	1.61228	1.61955	1.62670	1.63373	1.64063
5	1.47241	1.48036	1.48817	1.49584	1.50338	1.51078	1.51805
6	1.36698	1.37532	1.38351	1.39154	1.39942	1.40717	1.41478
7	1.27490	1.28360	1.29213	1.30051	1.30873	1.31680	1.32473
8	1.19252	1.20157	1.21044	1.21915	1.22769	1.23608	1.24431
9	1.11754	1.12693	1.13613	1.14516	1.15401	1.16270	1.17123
10	1.04838	1.05810	1.06762	1.07696	1.08612	1.09511	1.10393
11	0.98391	0.99395	1.00380	1.01345	1.02291	1.03220	1.04130
12	0.92329	0.93367	0.94383	0.95379	0.96355	0.97313	0.98252
13	0.86590	0.87660	0.88708	0.89735	0.90741	0.91728	0.92695
14	0.81123	0.82226	0.83306	0.84364	0.85400	0.86416	0.87412
15	0.75889	0.77025	0.78138	0.79226	0.80293	0.81338	0.82362
16	0.70856	0.72025	0.73170	0.74290	0.75387	0.76462	0.77514
17	0.65996	0.67200	0.68377	0.69529	0.70657	0.71761	0.72843
18	0.61288	0.62526	0.63737	0.64921	0.66080	0.67214	0.68325
19	0.56712	0.57985	0.59230	0.60447	0.61638	0.62803	0.63943
20	0.52252	0.53561	0.54841	0.56091	0.57314	0.58510	0.59681
21	0.47894	0.49240	0.50555	0.51839	0.53095	0.54323	0.55525
22	0.43625	0.45009	0.46360	0.47680	0.48969	0.50230	0.51463
23	0.39435	0.40857	0.42245	0.43601	0.44925	0.46219	0.47484
24	0.35312	0.36775	0.38201	0.39594	0.40953	0.42281	0.43579
25	0.31249	0.32753	0.34219	0.35649	0.37045	0.38408	0.39739
26	0.27237	0.28784	0.30290	0.31759	0.33192	0.34591	0.35958
27	0.23269	0.24859	0.26408	0.27917	0.29389	0.30825	0.32227
28	0.19337	0.20973	0.22565	0.24116	0.25627	0.27102	0.28540
29	0.15435	0.17118	0.18755	0.20349	0.21902	0.23416	0.24893
30	0.11556	0.13288	0.14972	0.16611	0.18207	0.19762	0.21277
31	0.07694	0.09478	0.11211	0.12896	0.14536	0.16134	0.17690
32	0.03844	0.05681	0.07465	0.09199	0.10885	0.12527	0.14125
33	0.00000	0.01893	0.03730	0.05514	0.07249	0.08936	0.10579
34			0.00000	0.01837	0.03622	0.05357	0.07045
35					0.00000	0.01785	0.03520
36							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	72	73	74	75	76	77	78
1	2.38785	2.39298	2.39802	2.40299	2.40789	2.41271	2.41747
2	2.01310	2.01890	2.02462	2.03024	2.03578	2.04124	2.04662
3	1.80071	1.80699	1.81317	1.81926	1.82525	1.83115	1.83696
4	1.64742	1.65410	1.66067	1.66714	1.67350	1.67976	1.68592
5	1.52520	1.53223	1.53914	1.54594	1.55263	1.55921	1.56569
6	1.42226	1.42961	1.43684	1.44395	1.45094	1.45782	1.46459
7	1.33252	1.34017	1.34770	1.35510	1.36237	1.36953	1.37657
8	1.25240	1.26034	1.26815	1.27583	1.28338	1.29080	1.29810
9	1.17961	1.18784	1.19592	1.20387	1.21168	1.21936	1.22691
10	1.11259	1.12110	1.12945	1.13766	1.14572	1.15365	1.16145
11	1.05024	1.05902	1.06764	1.07610	1.08442	1.09260	1.10063
12	0.99173	1.00078	1.00966	1.01838	1.02695	1.03537	1.04364
13	0.93644	0.94576	0.95490	0.96387	0.97269	0.98135	0.98986
14	0.88388	0.89346	0.90286	0.91209	0.92115	0.93005	0.93880
15	0.83366	0.84351	0.85317	0.86265	0.87196	0.88110	0.89008
16	0.78546	0.79558	0.80550	0.81524	0.82480	0.83418	0.84339
17	0.73903	0.74942	0.75960	0.76960	0.77940	0.78903	0.79848
18	0.69413	0.70480	0.71526	0.72551	0.73557	0.74544	0.75512
19	0.65060	0.66155	0.67227	0.68279	0.69310	0.70322	0.71314
20	0.60827	0.61950	0.63050	0.64128	0.65185	0.66222	0.67239
21	0.56701	0.57852	0.58980	0.60085	0.61168	0.62230	0.63272
22	0.52669	0.53850	0.55006	0.56138	0.57248	0.58336	0.59403
23	0.48721	0.49932	0.51117	0.52277	0.53414	0.54528	0.55621
24	0.44848	0.46089	0.47304	0.48493	0.49657	0.50798	0.51917
25	0.41041	0.42313	0.43558	0.44777	0.45970	0.47138	0.48283
26	0.37292	0.38597	0.39873	0.41122	0.42343	0.43540	0.44711
27	0.33596	0.34934	0.36242	0.37521	0.38772	0.39997	0.41196
28	0.29945	0.31317	0.32657	0.33968	0.35250	0.36504	0.37731
29	0.26333	0.27740	0.29114	0.30457	0.31770	0.33055	0.34311
30	0.22756	0.24199	0.25608	0.26984	0.28329	0.29645	0.30931
31	0.19208	0.20688	0.22133	0.23543	0.24922	0.26269	0.27586
32	0.15683	0.17202	0.18684	0.20130	0.21543	0.22923	0.24272
33	0.12178	0.13737	0.15257	0.16740	0.18188	0.19602	0.20983
34	0.08688	0.10289	0.11848	0.13370	0.14854	0.16303	0.17718
35	0.05209	0.06852	0.08453	0.10014	0.11536	0.13021	0.14471
36	0.01736	0.03424	0.05068	0.06670	0.08231	0.09754	0.11240
37		0.00000	0.01689	0.03333	0.04935	0.06497	0.08020
38				0.00000	0.01644	0.03247	0.04809
39						0.00000	0.01602

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	79	80	81	82	83	84	85
1	2.42215	2.42677	2.43133	2.43582	2.44026	2.44463	2.44894
2	2.05191	2.05714	2.06228	2.06735	2.07236	2.07729	2.08216
3	1.84268	1.84832	1.85387	1.85935	1.86475	1.87007	1.87532
4	1.69200	1.69798	1.70387	1.70968	1.71540	1.72104	1.72660
5	1.57207	1.57836	1.58455	1.59065	1.59665	1.60258	1.60841
6	1.47125	1.47781	1.48428	1.49064	1.49691	1.50309	1.50918
7	1.38350	1.39032	1.39704	1.40366	1.41017	1.41659	1.42292
8	1.30529	1.31236	1.31932	1.32617	1.33292	1.33957	1.34611
9	1.23434	1.24165	1.24884	1.25593	1.26290	1.26977	1.27653
10	1.16912	1.17666	1.18409	1.19139	1.19859	1.20567	1.21264
11	1.10854	1.11631	1.12396	1.13148	1.13889	1.14618	1.15336
12	1.05178	1.05978	1.06764	1.07539	1.08300	1.09050	1.09788
13	0.99822	1.00644	1.01453	1.02249	1.03031	1.03802	1.04560
14	0.94739	0.95584	0.96414	0.97231	0.98034	0.98825	0.99603
15	0.89890	0.90757	0.91609	0.92447	0.93271	0.94082	0.94880
16	0.85244	0.86134	0.87007	0.87867	0.88711	0.89542	0.90360
17	0.80776	0.81687	0.82583	0.83464	0.84329	0.85180	0.86017
18	0.76463	0.77398	0.78315	0.79217	0.80103	0.80975	0.81832
19	0.72289	0.73246	0.74186	0.75109	0.76016	0.76908	0.77785
20	0.68237	0.69217	0.70179	0.71124	0.72053	0.72965	0.73862
21	0.64294	0.65297	0.66282	0.67249	0.68199	0.69133	0.70050
22	0.60449	0.61476	0.62484	0.63473	0.64445	0.65399	0.66337
23	0.56692	0.57742	0.58773	0.59785	0.60779	0.61755	0.62714
24	0.53013	0.54088	0.55143	0.56178	0.57193	0.58191	0.59171
25	0.49404	0.50504	0.51583	0.52641	0.53680	0.54700	0.55701
26	0.45859	0.46985	0.48088	0.49170	0.50232	0.51274	0.52297
27	0.42371	0.43522	0.44651	0.45757	0.46842	0.47907	0.48952
28	0.38934	0.40111	0.41265	0.42397	0.43506	0.44594	0.45662
29	0.35542	0.36747	0.37927	0.39084	0.40218	0.41330	0.42421
30	0.32190	0.33423	0.34630	0.35813	0.36972	0.38108	0.39223
31	0.28875	0.30136	0.31371	0.32580	0.33765	0.34926	0.36065
32	0.25591	0.26881	0.28144	0.29381	0.30592	0.31779	0.32943
33	0.22334	0.23655	0.24947	0.26212	0.27450	0.28664	0.29852
34	0.19101	0.20453	0.21775	0.23069	0.24335	0.25576	0.26790
35	0.15888	0.17272	0.18625	0.19949	0.21244	0.22512	0.23753
36	0.12691	0.14108	0.15493	0.16848	0.18172	0.19469	0.20738
37	0.09507	0.10959	0.12377	0.13763	0.15118	0.16444	0.17741
38	0.06333	0.07820	0.09272	0.10691	0.12078	0.13434	0.14761
39	0.03165	0.04689	0.06177	0.07629	0.09049	0.10436	0.11793
40	0.00000	0.01562	0.03087	0.04575	0.06028	0.07448	0.08836
41			0.00000	0.01524	0.03013	0.04466	0.05886
42					0.00000	0.01488	0.02942
43							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	86	87	88	89	90	91	92
1	2.45320	2.45741	2.46156	2.46565	2.46970	2.47370	2.47764
2	2.08696	2.09170	2.09637	2.10099	2.10554	2.11004	2.11448
3	1.88049	1.88560	1.89064	1.89561	1.90052	1.90536	1.91015
4	1.73209	1.73750	1.74283	1.74810	1.75329	1.75842	1.76348
5	1.61417	1.61984	1.62544	1.63096	1.63641	1.64178	1.64709
6	1.51518	1.52110	1.52693	1.53269	1.53836	1.54396	1.54949
7	1.42915	1.43529	1.44135	1.44732	1.45321	1.45903	1.46476
8	1.35257	1.35893	1.36520	1.37138	1.37747	1.38348	1.38941
9	1.28320	1.28976	1.29624	1.30262	1.30891	1.31511	1.32123
10	1.21951	1.22628	1.23295	1.23952	1.24600	1.25239	1.25869
11	1.16043	1.16740	1.17426	1.18102	1.18769	1.19426	1.20073
12	1.10515	1.11231	1.11936	1.12631	1.13316	1.13990	1.14656
13	1.05306	1.06041	1.06765	1.07478	1.08181	1.08873	1.09555
14	1.00369	1.01122	1.01865	1.02596	1.03316	1.04026	1.04726
15	0.95665	0.96437	0.97198	0.97948	0.98686	0.99413	1.00129
16	0.91164	0.91956	0.92735	0.93502	0.94258	0.95002	0.95735
17	0.86841	0.87651	0.88449	0.89234	0.90007	0.90769	0.91519
18	0.82675	0.83504	0.84320	0.85123	0.85914	0.86693	0.87460
19	0.78647	0.79496	0.80330	0.81152	0.81960	0.82756	0.83540
20	0.74744	0.75611	0.76465	0.77304	0.78131	0.78944	0.79745
21	0.70952	0.71838	0.72710	0.73568	0.74412	0.75243	0.76061
22	0.67259	0.68165	0.69056	0.69932	0.70795	0.71643	0.72478
23	0.63656	0.64581	0.65492	0.66387	0.67267	0.68134	0.68986
24	0.60133	0.61079	0.62009	0.62923	0.63822	0.64706	0.65576
25	0.56684	0.57650	0.58600	0.59533	0.60451	0.61353	0.62241
26	0.53301	0.54288	0.55258	0.56210	0.57147	0.58068	0.58974
27	0.49979	0.50986	0.51976	0.52949	0.53905	0.54845	0.55769
28	0.46710	0.47739	0.48750	0.49743	0.50718	0.51677	0.52620
29	0.43491	0.44542	0.45574	0.46587	0.47582	0.48561	0.49522
30	0.40316	0.41389	0.42443	0.43477	0.44493	0.45491	0.46472
31	0.37182	0.38278	0.39353	0.40409	0.41445	0.42463	0.43464
32	0.34084	0.35203	0.36300	0.37378	0.38436	0.39474	0.40495
33	0.31018	0.32161	0.33281	0.34381	0.35461	0.36520	0.37561
34	0.27981	0.29148	0.30292	0.31415	0.32517	0.33598	0.34660
35	0.24970	0.26162	0.27330	0.28476	0.29601	0.30704	0.31787
36	0.21981	0.23199	0.24392	0.25562	0.26710	0.27835	0.28940
37	0.19012	0.20256	0.21475	0.22669	0.23841	0.24990	0.26117
38	0.16059	0.17330	0.18576	0.19796	0.20991	0.22164	0.23314
39	0.13121	0.14420	0.15692	0.16938	0.18159	0.19356	0.20530
40	0.10193	0.11521	0.12821	0.14094	0.15341	0.16563	0.17761
41	0.07275	0.08633	0.09961	0.11262	0.12536	0.13783	0.15006
42	0.04362	0.05751	0.07110	0.08439	0.09740	0.11014	0.12262
43	0.01454	0.02874	0.04263	0.05622	0.06952	0.08253	0.09528
44		0.00000	0.01421	0.02810	0.04169	0.05499	0.06801
45				0.00000	0.01389	0.02748	0.04078
46						0.00000	0.01359

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	93	94	95	96	97	98	99
1	2.48154	2.48540	2.48920	2.49297	2.49669	2.50036	2.50400
2	2.11887	2.12321	2.12749	2.13172	2.13590	2.14003	2.14411
3	1.91487	1.91953	1.92414	1.92869	1.93318	1.93763	1.94201
4	1.76848	1.77341	1.77828	1.78309	1.78784	1.79254	1.79718
5	1.65232	1.65749	1.66259	1.66763	1.67261	1.67752	1.68238
6	1.55494	1.56033	1.56564	1.57089	1.57607	1.58118	1.58624
7	1.47042	1.47600	1.48151	1.48695	1.49232	1.49762	1.50286
8	1.39526	1.40103	1.40673	1.41235	1.41790	1.42338	1.42879
9	1.32726	1.33321	1.33909	1.34489	1.35061	1.35626	1.36183
10	1.26491	1.27104	1.27708	1.28305	1.28894	1.29475	1.30049
11	1.20712	1.21342	1.21964	1.22577	1.23182	1.23779	1.24368
12	1.15311	1.15958	1.16596	1.17226	1.17847	1.18459	1.19064
13	1.10228	1.10891	1.11546	1.12191	1.12827	1.13455	1.14075
14	1.05415	1.06095	1.06765	1.07426	1.08078	1.08721	1.09356
15	1.00835	1.01531	1.02217	1.02894	1.03561	1.04219	1.04868
16	0.96458	0.97170	0.97872	0.98564	0.99246	0.99919	1.00583
17	0.92258	0.92986	0.93704	0.94411	0.95109	0.95797	0.96475
18	0.88215	0.88959	0.89693	0.90416	0.91129	0.91831	0.92524
19	0.84312	0.85072	0.85822	0.86560	0.87288	0.88006	0.88713
20	0.80533	0.81310	0.82075	0.82829	0.83572	0.84305	0.85027
21	0.76866	0.77659	0.78441	0.79210	0.79968	0.80716	0.81452
22	0.73300	0.74110	0.74907	0.75692	0.76466	0.77228	0.77980
23	0.69825	0.70651	0.71464	0.72266	0.73055	0.73832	0.74598
24	0.66432	0.67275	0.68105	0.68922	0.69727	0.70519	0.71301
25	0.63115	0.63974	0.64821	0.65654	0.66474	0.67282	0.68079
26	0.59865	0.60742	0.61605	0.62454	0.63291	0.64115	0.64926
27	0.56678	0.57572	0.58452	0.59318	0.60170	0.61010	0.61837
28	0.53547	0.54459	0.55356	0.56239	0.57108	0.57963	0.58805
29	0.50468	0.51398	0.52312	0.53212	0.54097	0.54969	0.55827
30	0.47436	0.48384	0.49316	0.50233	0.51136	0.52024	0.52898
31	0.44447	0.45414	0.46364	0.47299	0.48218	0.49123	0.50013
32	0.41498	0.42483	0.43452	0.44404	0.45341	0.46263	0.47170
33	0.38584	0.39588	0.40576	0.41547	0.42501	0.43440	0.44364
34	0.35702	0.36727	0.37733	0.38722	0.39695	0.40652	0.41593
35	0.32850	0.33895	0.34921	0.35929	0.36920	0.37895	0.38853
36	0.30025	0.31090	0.32136	0.33163	0.34173	0.35166	0.36142
37	0.27223	0.28309	0.29375	0.30423	0.31452	0.32464	0.33458
38	0.24443	0.25550	0.26637	0.27705	0.28754	0.29785	0.30797
39	0.21681	0.22810	0.23919	0.25008	0.26077	0.27127	0.28159
40	0.18936	0.20088	0.21219	0.22328	0.23418	0.24488	0.25539
41	0.16205	0.17380	0.18533	0.19665	0.20776	0.21866	0.22937
42	0.13486	0.14685	0.15861	0.17015	0.18148	0.19259	0.20351
43	0.10777	0.12001	0.13201	0.14378	0.15533	0.16666	0.17778
44	0.08076	0.09325	0.10550	0.11750	0.12928	0.14083	0.15217
45	0.05381	0.06656	0.07906	0.09131	0.10332	0.11510	0.12666
46	0.02689	0.03992	0.05267	0.06518	0.07743	0.08944	0.10123
47	0.00000	0.01330	0.02633	0.03909	0.05159	0.06385	0.07586
48			0.00000	0.01303	0.02579	0.03829	0.05055
49					0.00000	0.01276	0.02527
50							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	100	105	108	112	120	125	126
1	2.50759	2.52498	2.53498	2.54784	2.57208	2.58634	2.58912
2	2.14814	2.16766	2.17886	2.19326	2.22038	2.23630	2.23940
3	1.94635	1.96731	1.97934	1.99478	2.02385	2.04090	2.04421
4	1.80176	1.82389	1.83658	1.85288	1.88351	1.90146	1.90495
5	1.68718	1.71033	1.72361	1.74064	1.77263	1.79137	1.79501
6	1.59123	1.61531	1.62911	1.64681	1.68002	1.69947	1.70324
7	1.50803	1.53298	1.54726	1.56557	1.59992	1.62002	1.62392
8	1.43414	1.45990	1.47464	1.49353	1.52895	1.54966	1.55368
9	1.36734	1.39388	1.40906	1.42851	1.46494	1.48623	1.49036
10	1.30615	1.33344	1.34905	1.36902	1.40644	1.42828	1.43252
11	1.24950	1.27752	1.29354	1.31403	1.35239	1.37477	1.37911
12	1.19661	1.22534	1.24175	1.26275	1.30203	1.32493	1.32937
13	1.14687	1.17630	1.19311	1.21460	1.25477	1.27819	1.28273
14	1.09982	1.12994	1.14713	1.16911	1.21017	1.23409	1.23872
15	1.05509	1.08590	1.10347	1.12593	1.16786	1.19226	1.19700
16	1.01238	1.04387	1.06182	1.08475	1.12754	1.15243	1.15726
17	0.97145	1.00360	1.02193	1.04533	1.08898	1.11435	1.11927
18	0.93208	0.96491	0.98361	1.00748	1.05197	1.07783	1.08283
19	0.89411	0.92761	0.94668	0.97102	1.01636	1.04268	1.04778
20	0.85739	0.89156	0.91100	0.93581	0.98199	1.00879	1.01398
21	0.82179	0.85663	0.87645	0.90172	0.94874	0.97601	0.98129
22	0.78720	0.82272	0.84292	0.86866	0.91651	0.94426	0.94962
23	0.75353	0.78974	0.81031	0.83651	0.88521	0.91342	0.91888
24	0.72070	0.75759	0.77854	0.80521	0.85475	0.88344	0.88899
25	0.68863	0.72621	0.74753	0.77469	0.82507	0.85423	0.85986
26	0.65725	0.69552	0.71724	0.74486	0.79610	0.82573	0.83146
27	0.62651	0.66548	0.68758	0.71569	0.76778	0.79789	0.80370
28	0.59635	0.63603	0.65852	0.68711	0.74007	0.77065	0.77656
29	0.56672	0.60713	0.63001	0.65909	0.71291	0.74398	0.74997
30	0.53758	0.57872	0.60200	0.63157	0.68627	0.71782	0.72391
31	0.50890	0.55077	0.57445	0.60453	0.66011	0.69215	0.69833
32	0.48062	0.52324	0.54734	0.57792	0.63439	0.66692	0.67320
33	0.45273	0.49611	0.52062	0.55171	0.60909	0.64212	0.64849
34	0.42518	0.46934	0.49427	0.52588	0.58417	0.61770	0.62416
35	0.39796	0.44290	0.46826	0.50040	0.55961	0.59365	0.60021
36	0.37102	0.41677	0.44256	0.47523	0.53539	0.56993	0.57659
37	0.34436	0.39092	0.41715	0.45037	0.51147	0.54653	0.55329
38	0.31793	0.36533	0.39201	0.42578	0.48784	0.52343	0.53029
39	0.29173	0.33997	0.36712	0.40144	0.46449	0.50061	0.50756
40	0.26572	0.31483	0.34245	0.37734	0.44138	0.47804	0.48509
41	0.23990	0.28989	0.31798	0.35346	0.41851	0.45571	0.46287
42	0.21423	0.26513	0.29371	0.32978	0.39585	0.43361	0.44087
43	0.18870	0.24054	0.26961	0.30628	0.37340	0.41172	0.41909
44	0.16330	0.21608	0.24566	0.28295	0.35113	0.39002	0.39750
45	0.13800	0.19176	0.22186	0.25977	0.32904	0.36851	0.37609
46	0.11279	0.16754	0.19818	0.23674	0.30710	0.34717	0.35486
47	0.08765	0.14343	0.17461	0.21382	0.28531	0.32598	0.33379
48	0.06257	0.11940	0.15113	0.19102	0.26366	0.30494	0.31286
49	0.03753	0.09544	0.12774	0.16832	0.24213	0.28403	0.29207
50	0.01251	0.07153	0.10442	0.14571	0.22071	0.26325	0.27140

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	100	105	108	112	120	125	126
51		0.04766	0.08116	0.12317	0.19940	0.24258	0.25086
52		0.02383	0.05794	0.10069	0.17817	0.22201	0.23041
53		0.00000	0.03475	0.07826	0.15703	0.20154	0.21006
54			0.01158	0.05587	0.13595	0.18115	0.18980
55				0.03351	0.11493	0.16084	0.16962
56				0.01117	0.09397	0.14059	0.14950
57					0.07304	0.12040	0.12945
58					0.05215	0.10026	0.10945
59					0.03128	0.08016	0.08949
60					0.01043	0.06009	0.06956
61						0.04005	0.04967
62						0.02002	0.02979
63						0.00000	0.00993

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	128	135	140	144	147	150	160
1	2.59460	2.61305	2.62559	2.63527	2.64234	2.64925	2.67122
2	2.24551	2.26609	2.28006	2.29083	2.29869	2.30638	2.33078
3	2.05075	2.07275	2.08768	2.09919	2.10758	2.11578	2.14181
4	1.91184	1.93498	1.95068	1.96277	1.97158	1.98019	2.00751
5	1.80219	1.82632	1.84267	1.85527	1.86445	1.87341	1.90184
6	1.71069	1.73571	1.75265	1.76570	1.77521	1.78448	1.81390
7	1.63162	1.65745	1.67494	1.68840	1.69820	1.70777	1.73809
8	1.56160	1.58820	1.60619	1.62004	1.63013	1.63997	1.67114
9	1.49850	1.52583	1.54430	1.55852	1.56887	1.57896	1.61093
10	1.44087	1.46889	1.48783	1.50239	1.51299	1.52333	1.55606
11	1.38767	1.41635	1.43574	1.45064	1.46148	1.47206	1.50551
12	1.33813	1.36746	1.38728	1.40250	1.41358	1.42438	1.45855
13	1.29167	1.32164	1.34188	1.35742	1.36873	1.37975	1.41460
14	1.24786	1.27845	1.29909	1.31494	1.32647	1.33771	1.37323
15	1.20631	1.23751	1.25856	1.27471	1.28646	1.29791	1.33408
16	1.16676	1.19856	1.22000	1.23645	1.24842	1.26007	1.29689
17	1.12895	1.16134	1.18317	1.19992	1.21210	1.22396	1.26140
18	1.09269	1.12567	1.14789	1.16493	1.17731	1.18937	1.22744
19	1.05782	1.09138	1.11398	1.13131	1.14390	1.15616	1.19484
20	1.02419	1.05832	1.08130	1.09892	1.11172	1.12417	1.16347
21	0.99168	1.02639	1.04975	1.06765	1.08065	1.09330	1.13320
22	0.96019	0.99547	1.01920	1.03739	1.05059	1.06344	1.10393
23	0.92962	0.96548	0.98958	1.00805	1.02145	1.03449	1.07558
24	0.89990	0.93633	0.96081	0.97955	0.99316	1.00639	1.04808
25	0.87095	0.90795	0.93281	0.95183	0.96564	0.97907	1.02134
26	0.84272	0.88029	0.90552	0.92483	0.93883	0.95245	0.99532
27	0.81515	0.85329	0.87889	0.89848	0.91268	0.92650	0.96995
28	0.78818	0.82690	0.85288	0.87274	0.88715	0.90115	0.94520
29	0.76177	0.80107	0.82742	0.84757	0.86218	0.87638	0.92101
30	0.73589	0.77577	0.80250	0.82293	0.83773	0.85212	0.89734
31	0.71048	0.75095	0.77806	0.79877	0.81378	0.82836	0.87418
32	0.68553	0.72659	0.75408	0.77508	0.79029	0.80506	0.85147
33	0.66101	0.70265	0.73052	0.75181	0.76722	0.78219	0.82919
34	0.63687	0.67911	0.70737	0.72894	0.74456	0.75973	0.80732
35	0.61310	0.65594	0.68459	0.70645	0.72227	0.73764	0.78582
36	0.58967	0.63312	0.66216	0.68431	0.70034	0.71590	0.76469
37	0.56656	0.61062	0.64005	0.66250	0.67874	0.69450	0.74389
38	0.54374	0.58843	0.61826	0.64100	0.65745	0.67341	0.72341
39	0.52121	0.56653	0.59676	0.61979	0.63645	0.65261	0.70322
40	0.49894	0.54489	0.57552	0.59886	0.61573	0.63210	0.68332
41	0.47692	0.52350	0.55455	0.57819	0.59528	0.61185	0.66369
42	0.45512	0.50236	0.53382	0.55776	0.57507	0.59184	0.64431
43	0.43354	0.48143	0.51331	0.53757	0.55509	0.57208	0.62517
44	0.41216	0.46072	0.49302	0.51759	0.53533	0.55253	0.60626
45	0.39097	0.44020	0.47293	0.49781	0.51578	0.53319	0.58756
46	0.36995	0.41986	0.45303	0.47823	0.49643	0.51405	0.56906
47	0.34909	0.39970	0.43330	0.45883	0.47725	0.49509	0.55076
48	0.32839	0.37970	0.41375	0.43960	0.45826	0.47632	0.53264
49	0.30782	0.35984	0.39435	0.42054	0.43942	0.45770	0.51469
50	0.28739	0.34013	0.37510	0.40162	0.42075	0.43925	0.49691

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	128	135	140	144	147	150	160
51	0.26707	0.32055	0.35598	0.38285	0.40221	0.42094	0.47928
52	0.24686	0.30110	0.33700	0.36421	0.38382	0.40278	0.46181
53	0.22675	0.28176	0.31814	0.34570	0.36555	0.38475	0.44447
54	0.20674	0.26252	0.29938	0.32730	0.34741	0.36684	0.42726
55	0.18681	0.24338	0.28074	0.30902	0.32937	0.34904	0.41018
56	0.16695	0.22432	0.26219	0.29084	0.31145	0.33136	0.39322
57	0.14715	0.20535	0.24373	0.27275	0.29362	0.31378	0.37637
58	0.12742	0.18645	0.22536	0.25476	0.27589	0.29630	0.35963
59	0.10773	0.16762	0.20705	0.23684	0.25825	0.27891	0.34299
60	0.08809	0.14885	0.18882	0.21900	0.24068	0.26160	0.32644
61	0.06848	0.13013	0.17066	0.20123	0.22319	0.24437	0.30998
62	0.04889	0.11146	0.15254	0.18353	0.20577	0.22721	0.29361
63	0.02933	0.09282	0.13448	0.16588	0.18840	0.21012	0.27731
64	0.00978	0.07422	0.11646	0.14828	0.17110	0.19309	0.26109
65		0.05564	0.09848	0.13073	0.15385	0.17612	0.24493
66		0.03708	0.08053	0.11322	0.13664	0.15919	0.22884
67		0.01854	0.06261	0.09574	0.11947	0.14232	0.21281
68		0.00000	0.04471	0.07829	0.10234	0.12548	0.19683
69			0.02682	0.06087	0.08524	0.10868	0.18090
70			0.00894	0.04347	0.06816	0.09191	0.16502
71				0.02607	0.05110	0.07516	0.14918
72				0.00869	0.03406	0.05844	0.13338
73					0.01703	0.04173	0.11761
74					0.00000	0.02503	0.10187
75						0.00834	0.08616
76							0.07046
77							0.05479
78							0.03912
79							0.02347
80							0.00782

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	162	168	175	180	189	192	196
1	2.67543	2.68773	2.70148	2.71093	2.72724	2.73248	2.73934
2	2.33546	2.34910	2.36434	2.37481	2.39286	2.39867	2.40625
3	2.14679	2.16133	2.17755	2.18870	2.20790	2.21406	2.22212
4	2.01274	2.02799	2.04500	2.05667	2.07678	2.08324	2.09167
5	1.90728	1.92313	1.94081	1.95294	1.97382	1.98052	1.98928
6	1.81953	1.83592	1.85419	1.86673	1.88830	1.89522	1.90426
7	1.74389	1.76077	1.77959	1.79250	1.81470	1.82182	1.83111
8	1.67709	1.69444	1.71376	1.72701	1.74979	1.75709	1.76663
9	1.61703	1.63481	1.65462	1.66819	1.69151	1.69899	1.70876
10	1.56231	1.58050	1.60075	1.61463	1.63848	1.64612	1.65610
11	1.51190	1.53049	1.55118	1.56535	1.58969	1.59749	1.60767
12	1.46506	1.48404	1.50514	1.51960	1.54442	1.55238	1.56275
13	1.42124	1.44059	1.46210	1.47683	1.50211	1.51022	1.52078
14	1.38000	1.39970	1.42161	1.43660	1.46234	1.47058	1.48133
15	1.34098	1.36103	1.38333	1.39858	1.42476	1.43314	1.44407
16	1.30390	1.32430	1.34697	1.36248	1.38908	1.39760	1.40871
17	1.26853	1.28927	1.31232	1.32808	1.35510	1.36375	1.37503
18	1.23469	1.25576	1.27917	1.29518	1.32261	1.33139	1.34284
19	1.20220	1.22361	1.24738	1.26362	1.29147	1.30038	1.31199
20	1.17094	1.19267	1.21680	1.23328	1.26152	1.27056	1.28234
21	1.14078	1.16284	1.18731	1.20403	1.23268	1.24184	1.25377
22	1.11163	1.13401	1.15883	1.17578	1.20482	1.21410	1.22620
23	1.08340	1.10609	1.13126	1.14844	1.17787	1.18727	1.19953
24	1.05600	1.07901	1.10452	1.12194	1.15175	1.16127	1.17368
25	1.02937	1.05270	1.07855	1.09619	1.12639	1.13604	1.14860
26	1.00346	1.02710	1.05329	1.07116	1.10173	1.11150	1.12422
27	0.97820	1.00215	1.02868	1.04678	1.07773	1.08762	1.10049
28	0.95356	0.97782	1.00469	1.02301	1.05434	1.06435	1.07737
29	0.92947	0.95405	0.98125	0.99980	1.03151	1.04163	1.05481
30	0.90592	0.93081	0.95835	0.97712	1.00921	1.01945	1.03277
31	0.88286	0.90806	0.93594	0.95493	0.98739	0.99775	1.01123
32	0.86026	0.88577	0.91399	0.93321	0.96604	0.97652	0.99014
33	0.83809	0.86391	0.89247	0.91191	0.94512	0.95571	0.96949
34	0.81633	0.84246	0.87135	0.89102	0.92460	0.93531	0.94924
35	0.79495	0.82140	0.85062	0.87052	0.90447	0.91530	0.92938
36	0.77392	0.80069	0.83025	0.85037	0.88470	0.89564	0.90987
37	0.75324	0.78031	0.81022	0.83056	0.86527	0.87633	0.89071
38	0.73287	0.76026	0.79051	0.81108	0.84616	0.85734	0.87187
39	0.71279	0.74051	0.77110	0.79190	0.82735	0.83865	0.85333
40	0.69301	0.72104	0.75197	0.77300	0.80883	0.82025	0.83508
41	0.67349	0.70185	0.73312	0.75438	0.79059	0.80212	0.81711
42	0.65422	0.68290	0.71453	0.73601	0.77261	0.78426	0.79939
43	0.63520	0.66420	0.69618	0.71789	0.75487	0.76664	0.78193
44	0.61640	0.64574	0.67806	0.70001	0.73737	0.74925	0.76469
45	0.59782	0.62748	0.66016	0.68234	0.72009	0.73209	0.74769
46	0.57944	0.60944	0.64247	0.66489	0.70302	0.71515	0.73089
47	0.56125	0.59159	0.62498	0.64763	0.68615	0.69840	0.71431
48	0.54325	0.57393	0.60768	0.63057	0.66948	0.68185	0.69791
49	0.52543	0.55644	0.59056	0.61369	0.65300	0.66549	0.68170
50	0.50777	0.53913	0.57361	0.59698	0.63668	0.64930	0.66567

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	162	168	175	180	189	192	196
51	0.49026	0.52197	0.55682	0.58044	0.62054	0.63328	0.64981
52	0.47291	0.50497	0.54019	0.56405	0.60456	0.61742	0.63411
53	0.45570	0.48811	0.52371	0.54782	0.58873	0.60171	0.61856
54	0.43862	0.47139	0.50737	0.53172	0.57304	0.58615	0.60316
55	0.42167	0.45480	0.49116	0.51577	0.55750	0.57074	0.58791
56	0.40484	0.43834	0.47508	0.49994	0.54209	0.55545	0.57279
57	0.38812	0.42199	0.45913	0.48424	0.52680	0.54030	0.55780
58	0.37151	0.40576	0.44329	0.46866	0.51164	0.52527	0.54293
59	0.35500	0.38963	0.42756	0.45319	0.49660	0.51036	0.52819
60	0.33859	0.37360	0.41193	0.43783	0.48167	0.49556	0.51355
61	0.32227	0.35767	0.39641	0.42257	0.46684	0.48086	0.49903
62	0.30604	0.34182	0.38098	0.40741	0.45212	0.46627	0.48461
63	0.28988	0.32607	0.36564	0.39234	0.43749	0.45178	0.47029
64	0.27380	0.31039	0.35039	0.37736	0.42296	0.43739	0.45607
65	0.25779	0.29479	0.33521	0.36247	0.40851	0.42308	0.44194
66	0.24185	0.27926	0.32012	0.34765	0.39415	0.40886	0.42790
67	0.22597	0.26380	0.30510	0.33291	0.37988	0.39472	0.41394
68	0.21014	0.24840	0.29014	0.31825	0.36568	0.38066	0.40006
69	0.19437	0.23306	0.27525	0.30365	0.35155	0.36668	0.38626
70	0.17865	0.21778	0.26042	0.28912	0.33749	0.35276	0.37253
71	0.16297	0.20254	0.24565	0.27464	0.32350	0.33892	0.35887
72	0.14733	0.18736	0.23093	0.26023	0.30957	0.32514	0.34528
73	0.13173	0.17221	0.21626	0.24586	0.29570	0.31142	0.33175
74	0.11615	0.15711	0.20164	0.23155	0.28189	0.29776	0.31828
75	0.10061	0.14204	0.18706	0.21729	0.26813	0.28416	0.30487
76	0.08509	0.12700	0.17252	0.20307	0.25442	0.27060	0.29151
77	0.06959	0.11199	0.15802	0.18889	0.24076	0.25710	0.27821
78	0.05411	0.09701	0.14355	0.17475	0.22715	0.24364	0.26495
79	0.03864	0.08205	0.12911	0.16064	0.21357	0.23023	0.25175
80	0.02318	0.06711	0.11470	0.14657	0.20004	0.21686	0.23858
81	0.00773	0.05218	0.10031	0.13252	0.18654	0.20353	0.22546
82		0.03726	0.08594	0.11850	0.17308	0.19023	0.21237
83		0.02235	0.07159	0.10451	0.15965	0.17697	0.19932
84		0.00745	0.05725	0.09053	0.14624	0.16374	0.18631
85			0.04293	0.07657	0.13286	0.15053	0.17332
86			0.02862	0.06263	0.11951	0.13736	0.16037
87			0.01431	0.04870	0.10618	0.12421	0.14744
88			0.00000	0.03478	0.09287	0.11107	0.13454
89				0.02087	0.07957	0.09796	0.12166
90				0.00695	0.06629	0.08487	0.10880
91					0.05301	0.07179	0.09596
92					0.03975	0.05872	0.08313
93					0.02650	0.04566	0.07032
94					0.01325	0.03261	0.05752
95					0.00000	0.01956	0.04473
96						0.00652	0.03194
97							0.01916
98							0.00639

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	200	210	216	224	225	240	243
1	2.74604	2.76217	2.77145	2.78339	2.78485	2.80592	2.80997
2	2.41365	2.43147	2.44171	2.45488	2.45649	2.47971	2.48416
3	2.22999	2.24892	2.25979	2.27376	2.27547	2.30009	2.30480
4	2.09991	2.11970	2.13107	2.14567	2.14746	2.17317	2.17810
5	1.99783	2.01836	2.03015	2.04529	2.04713	2.07378	2.07888
6	1.91308	1.93427	1.94643	1.96204	1.96395	1.99141	1.99667
7	1.84019	1.86198	1.87447	1.89052	1.89247	1.92068	1.92608
8	1.77594	1.79828	1.81109	1.82753	1.82953	1.85843	1.86395
9	1.71828	1.74114	1.75424	1.77105	1.77310	1.80264	1.80829
10	1.66583	1.68918	1.70256	1.71972	1.72182	1.75196	1.75772
11	1.61760	1.64142	1.65506	1.67256	1.67470	1.70542	1.71129
12	1.57287	1.59714	1.61104	1.62886	1.63103	1.66231	1.66828
13	1.53109	1.55579	1.56993	1.58806	1.59027	1.62208	1.62816
14	1.49182	1.51694	1.53132	1.54975	1.55200	1.58433	1.59050
15	1.45472	1.48025	1.49487	1.51359	1.51588	1.54870	1.55497
16	1.41953	1.44546	1.46030	1.47931	1.48163	1.51495	1.52130
17	1.38602	1.41234	1.42740	1.44669	1.44904	1.48283	1.48928
18	1.35399	1.38070	1.39597	1.41553	1.41792	1.45218	1.45872
19	1.32330	1.35038	1.36587	1.38570	1.38812	1.42284	1.42946
20	1.29381	1.32126	1.33696	1.35705	1.35950	1.39467	1.40137
21	1.26540	1.29322	1.30912	1.32948	1.33195	1.36757	1.37436
22	1.23798	1.26616	1.28227	1.30288	1.30539	1.34144	1.34831
23	1.21146	1.24000	1.25631	1.27717	1.27971	1.31619	1.32314
24	1.18577	1.21466	1.23117	1.25228	1.25485	1.29176	1.29879
25	1.16084	1.19008	1.20678	1.22814	1.23074	1.26807	1.27518
26	1.13661	1.16620	1.18310	1.20470	1.20733	1.24508	1.25227
27	1.11303	1.14297	1.16006	1.18191	1.18457	1.22273	1.22999
28	1.09005	1.12034	1.13762	1.15971	1.16240	1.20097	1.20831
29	1.06763	1.09827	1.11574	1.13807	1.14079	1.17977	1.18719
30	1.04574	1.07672	1.09438	1.11695	1.11970	1.15908	1.16658
31	1.02434	1.05566	1.07351	1.09632	1.09909	1.13888	1.14645
32	1.00340	1.03506	1.05310	1.07614	1.07895	1.11914	1.12678
33	0.98290	1.01488	1.03311	1.05640	1.05923	1.09982	1.10754
34	0.96279	0.99512	1.01354	1.03706	1.03992	1.08090	1.08870
35	0.94307	0.97573	0.99434	1.01809	1.02098	1.06237	1.07023
36	0.92371	0.95671	0.97550	0.99949	1.00241	1.04419	1.05213
37	0.90469	0.93803	0.95701	0.98123	0.98418	1.02635	1.03436
38	0.88599	0.91967	0.93883	0.96329	0.96626	1.00883	1.01692
39	0.86760	0.90161	0.92096	0.94565	0.94866	0.99162	0.99978
40	0.84950	0.88384	0.90338	0.92831	0.93134	0.97469	0.98293
41	0.83167	0.86635	0.88608	0.91124	0.91429	0.95804	0.96635
42	0.81410	0.84912	0.86904	0.89443	0.89751	0.94166	0.95003
43	0.79678	0.83214	0.85224	0.87787	0.88098	0.92552	0.93397
44	0.77969	0.81539	0.83568	0.86155	0.86469	0.90962	0.91814
45	0.76283	0.79887	0.81935	0.84545	0.84862	0.89394	0.90254
46	0.74619	0.78257	0.80324	0.82957	0.83277	0.87848	0.88715
47	0.72975	0.76647	0.78733	0.81390	0.81712	0.86323	0.87198
48	0.71350	0.75057	0.77162	0.79842	0.80168	0.84818	0.85700
49	0.69744	0.73486	0.75609	0.78314	0.78642	0.83332	0.84221
50	0.68156	0.71932	0.74075	0.76803	0.77134	0.81864	0.82760

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	200	210	216	224	225	240	243
51	0.66585	0.70396	0.72558	0.75310	0.75644	0.80413	0.81317
52	0.65030	0.68876	0.71058	0.73833	0.74170	0.78980	0.79890
53	0.63490	0.67372	0.69573	0.72373	0.72712	0.77562	0.78480
54	0.61966	0.65883	0.68103	0.70927	0.71270	0.76160	0.77085
55	0.60456	0.64408	0.66648	0.69497	0.69842	0.74772	0.75705
56	0.58959	0.62948	0.65207	0.68080	0.68428	0.73399	0.74339
57	0.57476	0.61501	0.63780	0.66677	0.67028	0.72039	0.72987
58	0.56005	0.60066	0.62365	0.65287	0.65641	0.70693	0.71648
59	0.54546	0.58644	0.60963	0.63909	0.64267	0.69359	0.70322
60	0.53099	0.57233	0.59573	0.62544	0.62904	0.68038	0.69008
61	0.51663	0.55834	0.58194	0.61190	0.61553	0.66728	0.67706
62	0.50237	0.54446	0.56826	0.59847	0.60213	0.65430	0.66416
63	0.48822	0.53068	0.55468	0.58515	0.58884	0.64143	0.65136
64	0.47416	0.51700	0.54121	0.57193	0.57566	0.62866	0.63867
65	0.46020	0.50342	0.52784	0.55882	0.56257	0.61599	0.62608
66	0.44632	0.48993	0.51456	0.54579	0.54958	0.60343	0.61359
67	0.43253	0.47652	0.50136	0.53286	0.53668	0.59095	0.60119
68	0.41882	0.46321	0.48826	0.52002	0.52386	0.57857	0.58889
69	0.40519	0.44997	0.47524	0.50726	0.51114	0.56628	0.57667
70	0.39164	0.43682	0.46230	0.49459	0.49850	0.55407	0.56454
71	0.37816	0.42373	0.44944	0.48199	0.48593	0.54194	0.55250
72	0.36474	0.41072	0.43665	0.46947	0.47344	0.52989	0.54053
73	0.35139	0.39778	0.42393	0.45702	0.46103	0.51792	0.52864
74	0.33811	0.38491	0.41128	0.44465	0.44869	0.50603	0.51682
75	0.32488	0.37210	0.39869	0.43234	0.43641	0.49420	0.50508
76	0.31171	0.35935	0.38617	0.42010	0.42420	0.48244	0.49340
77	0.29859	0.34666	0.37371	0.40792	0.41205	0.47075	0.48180
78	0.28553	0.33402	0.36131	0.39580	0.39997	0.45912	0.47025
79	0.27251	0.32144	0.34896	0.38373	0.38794	0.44756	0.45877
80	0.25954	0.30891	0.33666	0.37173	0.37596	0.43605	0.44735
81	0.24661	0.29643	0.32442	0.35977	0.36404	0.42461	0.43599
82	0.23373	0.28399	0.31222	0.34787	0.35218	0.41321	0.42468
83	0.22088	0.27160	0.30007	0.33602	0.34036	0.40188	0.41343
84	0.20807	0.25924	0.28797	0.32421	0.32859	0.39059	0.40223
85	0.19529	0.24693	0.27590	0.31245	0.31686	0.37935	0.39108
86	0.18254	0.23466	0.26388	0.30073	0.30518	0.36816	0.37998
87	0.16983	0.22242	0.25189	0.28906	0.29354	0.35701	0.36892
88	0.15714	0.21021	0.23994	0.27742	0.28194	0.34591	0.35791
89	0.14448	0.19803	0.22803	0.26582	0.27038	0.33486	0.34694
90	0.13184	0.18589	0.21615	0.25425	0.25885	0.32384	0.33602
91	0.11922	0.17377	0.20429	0.24272	0.24736	0.31286	0.32513
92	0.10662	0.16168	0.19247	0.23123	0.23590	0.30192	0.31429
93	0.09404	0.14961	0.18067	0.21976	0.22447	0.29102	0.30348
94	0.08147	0.13756	0.16890	0.20832	0.21307	0.28015	0.29270
95	0.06891	0.12553	0.15715	0.19691	0.20170	0.26931	0.28196
96	0.05637	0.11352	0.14543	0.18552	0.19035	0.25851	0.27125
97	0.04383	0.10153	0.13372	0.17416	0.17903	0.24773	0.26058
98	0.03130	0.08955	0.12203	0.16282	0.16773	0.23699	0.24993
99	0.01878	0.07758	0.11036	0.15150	0.15645	0.22627	0.23931
100	0.00626	0.06563	0.09870	0.14020	0.14520	0.21557	0.22872

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	200	210	216	224	225	240	243
101		0.05368	0.08706	0.12892	0.13396	0.20491	0.21815
102		0.04175	0.07543	0.11766	0.12274	0.19426	0.20761
103		0.02981	0.06381	0.10641	0.11153	0.18364	0.19709
104		0.01789	0.05219	0.09517	0.10034	0.17304	0.18659
105		0.00596	0.04059	0.08394	0.08916	0.16245	0.17611
106			0.02899	0.07273	0.07799	0.15189	0.16565
107			0.01739	0.06153	0.06683	0.14134	0.15521
108			0.00580	0.05033	0.05568	0.13081	0.14479
109				0.03914	0.04453	0.12029	0.13438
110				0.02795	0.03340	0.10979	0.12399
111				0.01677	0.02226	0.09929	0.11361
112				0.00559	0.01113	0.08881	0.10325
113					0.00000	0.07834	0.09289
114						0.06788	0.08254
115						0.05742	0.07221
116						0.04697	0.06188
117						0.03653	0.05155
118						0.02609	0.04124
119						0.01565	0.03092
120						0.00522	0.02061
121							0.01031
122							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	245	250	252	256	270	280	288
1	2.81263	2.81918	2.82177	2.82686	2.84404	2.85572	2.86474
2	2.48709	2.49431	2.49715	2.50276	2.52164	2.53447	2.54437
3	2.30791	2.31555	2.31856	2.32450	2.34449	2.35807	2.36854
4	2.18134	2.18932	2.19246	2.19866	2.21951	2.23367	2.24458
5	2.08224	2.09050	2.09375	2.10017	2.12175	2.13639	2.14769
6	2.00013	2.00864	2.01199	2.01860	2.04082	2.05590	2.06752
7	1.92963	1.93837	1.94181	1.94859	1.97139	1.98686	1.99877
8	1.86759	1.87654	1.88006	1.88700	1.91034	1.92616	1.93835
9	1.81201	1.82115	1.82474	1.83184	1.85568	1.87183	1.88428
10	1.76152	1.77084	1.77451	1.78174	1.80605	1.82252	1.83521
11	1.71516	1.72466	1.72839	1.73576	1.76052	1.77729	1.79020
12	1.67222	1.68189	1.68569	1.69319	1.71837	1.73542	1.74855
13	1.63216	1.64199	1.64585	1.65348	1.67907	1.69640	1.70974
14	1.59456	1.60455	1.60848	1.61622	1.64221	1.65980	1.67334
15	1.55910	1.56923	1.57322	1.58108	1.60745	1.62530	1.63903
16	1.52549	1.53577	1.53982	1.54779	1.57454	1.59263	1.60656
17	1.49352	1.50395	1.50805	1.51613	1.54325	1.56159	1.57569
18	1.46302	1.47359	1.47774	1.48593	1.51340	1.53197	1.54626
19	1.43382	1.44452	1.44873	1.45702	1.48484	1.50365	1.51811
20	1.40579	1.41663	1.42089	1.42929	1.45745	1.47640	1.49112
21	1.37882	1.38980	1.39411	1.40261	1.43111	1.45037	1.46517
22	1.35283	1.36393	1.36830	1.37690	1.40573	1.42520	[illegible]4017
23	1.32772	1.33895	1.34337	1.35206	1.38122	1.40091	[illegible]605
24	1.30342	1.31478	1.31924	1.32804	1.35751	1.37742	1.39272
25	1.27986	1.29135	1.29586	1.30476	1.33455	1.35467	1.37012
26	1.25700	1.26861	1.27317	1.28216	1.31227	1.33259	1.34821
27	1.23477	1.24651	1.25112	1.26020	1.29062	1.31115	1.32692
28	1.21314	1.22500	1.22966	1.23884	1.26956	1.29030	1.30622
29	1.19207	1.20405	1.20875	1.21802	1.24905	1.26999	1.28606
30	1.17151	1.18361	1.18836	1.19772	1.22906	1.25019	1.26642
31	1.15143	1.16365	1.16845	1.17790	1.20954	1.23087	1.24725
32	1.13181	1.14415	1.14899	1.15854	1.19047	1.21200	1.22853
33	1.11262	1.12507	1.12996	1.13960	1.17183	1.19356	1.21023
34	1.09382	1.10640	1.11133	1.12106	1.15359	1.17551	1.19233
35	1.07541	1.08810	1.09308	1.10290	1.13572	1.15783	1.17480
36	1.05735	1.07016	1.07519	1.08509	1.11821	1.14051	1.15763
37	1.03963	1.05256	1.05763	1.06762	1.10103	1.12353	1.14079
38	1.02224	1.03528	1.04040	1.05048	1.08418	1.10687	1.12427
39	1.00514	1.01830	1.02347	1.03363	1.06762	1.09050	1.10805
40	0.98834	1.00161	1.00682	1.01708	1.05136	1.07443	1.09211
41	0.97181	0.98520	0.99045	1.00080	1.03536	1.05862	1.07645
42	0.95554	0.96905	0.97435	0.98478	1.01963	1.04308	1.06105
43	0.93952	0.95314	0.95849	0.96901	1.00415	1.02779	1.04590
44	0.92374	0.93748	0.94287	0.95348	0.98890	1.01273	1.03098
45	0.90819	0.92204	0.92748	0.93817	0.97389	0.99790	1.01629
46	0.89285	0.90682	0.91230	0.92308	0.95908	0.98328	1.00182
47	0.87772	0.89180	0.89733	0.90820	0.94449	0.96887	0.98755
48	0.86279	0.87699	0.88256	0.89352	0.93009	0.95466	0.97348
49	0.84805	0.86236	0.86798	0.87902	0.91589	0.94065	0.95960
50	0.83349	0.84792	0.85358	0.86471	0.90186	0.92681	0.94591

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	245	250	252	256	270	280	288
51	0.81910	0.83365	0.83936	0.85058	0.88801	0.91315	0.93239
52	0.80489	0.81955	0.82530	0.83661	0.87433	0.89966	0.91903
53	0.79083	0.80561	0.81141	0.82281	0.86082	0.88632	0.90584
54	0.77693	0.79183	0.79767	0.80915	0.84745	0.87315	0.89281
55	0.76318	0.77819	0.78408	0.79565	0.83424	0.86013	0.87992
56	0.74957	0.76470	0.77063	0.78230	0.82117	0.84724	0.86718
57	0.73610	0.75135	0.75732	0.76908	0.80824	0.83450	0.85458
58	0.72276	0.73812	0.74415	0.75599	0.79545	0.82190	0.84212
59	0.70954	0.72503	0.73110	0.74303	0.78278	0.80942	0.82978
60	0.69645	0.71206	0.71817	0.73020	0.77024	0.79706	0.81757
61	0.68348	0.69921	0.70537	0.71748	0.75781	0.78483	0.80548
62	0.67063	0.68647	0.69268	0.70488	0.74551	0.77272	0.79350
63	0.65788	0.67384	0.68010	0.69239	0.73331	0.76071	0.78164
64	0.64524	0.66132	0.66763	0.68001	0.72123	0.74882	0.76989
65	0.63270	0.64891	0.65525	0.66773	0.70924	0.73703	0.75824
66	0.62026	0.63659	0.64298	0.65555	0.69736	0.72534	0.74670
67	0.60791	0.62437	0.63081	0.64347	0.68558	0.71375	0.73525
68	0.59566	0.61224	0.61873	0.63148	0.67389	0.70225	0.72390
69	0.58350	0.60020	0.60674	0.61958	0.66229	0.69085	0.71264
70	0.57142	0.58824	0.59483	0.60777	0.65079	0.67954	0.70148
71	0.55943	0.57637	0.58301	0.59604	0.63936	0.66831	0.69039
72	0.54751	0.56458	0.57127	0.58440	0.62802	0.65717	0.67940
73	0.53567	0.55287	0.55961	0.57283	0.61676	0.64610	0.66848
74	0.52391	0.54124	0.54802	0.56134	0.60558	0.63512	0.65764
75	0.51222	0.52967	0.53651	0.54992	0.59447	0.62421	0.64688
76	0.50060	0.51818	0.52506	0.53858	0.58344	0.61338	0.63620
77	0.48904	0.50676	0.51369	0.52730	0.57247	0.60262	0.62559
78	0.47755	0.49540	0.50238	0.51609	0.56158	0.59192	0.61504
79	0.46613	0.48410	0.49114	0.50494	0.55075	0.58130	0.60457
80	0.45476	0.47287	0.47995	0.49386	0.53999	0.57074	0.59416
81	0.44345	0.46169	0.46883	0.48284	0.52928	0.56024	0.58381
82	0.43220	0.45058	0.45777	0.47187	0.51864	0.54980	0.57353
83	0.42101	0.43952	0.44676	0.46096	0.50806	0.53943	0.56331
84	0.40986	0.42851	0.43580	0.45011	0.49753	0.52911	0.55314
85	0.39877	0.41755	0.42490	0.43931	0.48706	0.51885	0.54304
86	0.38772	0.40665	0.41404	0.42856	0.47664	0.50864	0.53298
87	0.37673	0.39579	0.40324	0.41786	0.46627	0.49848	0.52299
88	0.36577	0.38498	0.39248	0.40721	0.45595	0.48838	0.51304
89	0.35487	0.37421	0.38177	0.39660	0.44569	0.47832	0.50314
90	0.34400	0.36349	0.37110	0.38604	0.43546	0.46832	0.49330
91	0.33317	0.35280	0.36048	0.37552	0.42529	0.45836	0.48350
92	0.32239	0.34216	0.34989	0.36504	0.41515	0.44844	0.47374
93	0.31164	0.33156	0.33934	0.35460	0.40506	0.43857	0.46404
94	0.30092	0.32099	0.32883	0.34420	0.39501	0.42875	0.45437
95	0.29025	0.31046	0.31836	0.33384	0.38500	0.41896	0.44475
96	0.27960	0.29997	0.30792	0.32352	0.37503	0.40921	0.43517
97	0.26899	0.28951	0.29752	0.31322	0.36510	0.39951	0.42563
98	0.25840	0.27907	0.28714	0.30296	0.35520	0.38984	0.41612
99	0.24785	0.26867	0.27680	0.29274	0.34533	0.38020	0.40666
100	0.23732	0.25830	0.26649	0.28254	0.33550	0.37060	0.39723

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	245	250	252	256	270	280	288
101	0.22682	0.24796	0.25621	0.27237	0.32571	0.36104	0.38783
102	0.21634	0.23764	0.24595	0.26223	0.31594	0.35151	0.37847
103	0.20589	0.22735	0.23572	0.25212	0.30620	0.34201	0.36915
104	0.19546	0.21708	0.22551	0.24203	0.29650	0.33254	0.35985
105	0.18505	0.20683	0.21533	0.23197	0.28682	0.32310	0.35059
106	0.17466	0.19661	0.20517	0.22193	0.27716	0.31369	0.34135
107	0.16429	0.18641	0.19503	0.21192	0.26754	0.30430	0.33215
108	0.15394	0.17622	0.18491	0.20192	0.25793	0.29495	0.32297
109	0.14360	0.16606	0.17481	0.19195	0.24836	0.28562	0.31382
110	0.13328	0.15591	0.16473	0.18199	0.23880	0.27631	0.30470
111	0.12297	0.14577	0.15466	0.17205	0.22927	0.26703	0.29560
112	0.11268	0.13566	0.14461	0.16213	0.21975	0.25777	0.28653
113	0.10240	0.12555	0.13457	0.15223	0.21026	0.24853	0.27748
114	0.09213	0.11546	0.12455	0.14234	0.20078	0.23932	0.26845
115	0.08187	0.10538	0.11454	0.13246	0.19133	0.23012	0.25945
116	0.07162	0.09531	0.10454	0.12260	0.18189	0.22095	0.25046
117	0.06137	0.08526	0.09456	0.11275	0.17246	0.21179	0.24150
118	0.05113	0.07520	0.08458	0.10291	0.16306	0.20265	0.23255
119	0.04090	0.06516	0.07461	0.09308	0.15366	0.19353	0.22363
120	0.03067	0.05513	0.06464	0.08325	0.14428	0.18442	0.21472
121	0.02045	0.04510	0.05469	0.07344	0.13492	0.17533	0.20583
122	0.01022	0.03507	0.04474	0.06363	0.12556	0.16625	0.19695
123	0.00000	0.02505	0.03479	0.05383	0.11622	0.15719	0.18809
124		0.01503	0.02485	0.04404	0.10688	0.14814	0.17925
125		0.00501	0.01491	0.03425	0.09756	0.13910	0.17041
126			0.00497	0.02446	0.08824	0.13007	0.16160
127				0.01468	0.07893	0.12106	0.15279
128				0.00489	0.06963	0.11205	0.14400
129					0.06033	0.10305	0.13522
130					0.05104	0.09406	0.12644
131					0.04176	0.08508	0.11768
132					0.03247	0.07611	0.10893
133					0.02319	0.06714	0.10018
134					0.01392	0.05818	0.09145
135					0.00464	0.04922	0.08272
136						0.04026	0.07399
137						0.03131	0.06527
138						0.02237	0.05656
139						0.01342	0.04785
140						0.00447	0.03915
141							0.03044
142							0.02174
143							0.01305
144							0.00435

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	294	300	315	320	324	336	343
1	2.87133	2.87777	2.89327	2.89826	2.90219	2.91367	2.92016
2	2.55160	2.55867	2.57567	2.58114	2.58544	2.59802	2.60512
3	2.37618	2.38365	2.40162	2.40739	2.41194	2.42521	2.43271
4	2.25255	2.26033	2.27904	2.28506	2.28979	2.30361	2.31141
5	2.15592	2.16397	2.18331	2.18952	2.19441	2.20869	2.21675
6	2.07599	2.08427	2.10416	2.11055	2.11558	2.13025	2.13854
7	2.00747	2.01595	2.03634	2.04289	2.04804	2.06307	2.07156
8	1.94724	1.95592	1.97676	1.98345	1.98872	2.00408	2.01276
9	1.89335	1.90220	1.92347	1.93030	1.93567	1.95134	1.96018
10	1.84445	1.85348	1.87515	1.88210	1.88757	1.90353	1.91253
11	1.79961	1.80879	1.83084	1.83792	1.84348	1.85971	1.86887
12	1.75812	1.76746	1.78986	1.79705	1.80271	1.81920	1.82850
13	1.71945	1.72894	1.75169	1.75899	1.76473	1.78147	1.79091
14	1.68320	1.69283	1.71591	1.72332	1.72915	1.74612	1.75570
15	1.64904	1.65880	1.68221	1.68972	1.69562	1.71283	1.72254
16	1.61670	1.62659	1.65031	1.65792	1.66391	1.68134	1.69117
17	1.58597	1.59599	1.62002	1.62772	1.63378	1.65143	1.66138
18	1.55666	1.56681	1.59114	1.59893	1.60507	1.62293	1.63300
19	1.52864	1.53891	1.56353	1.57142	1.57762	1.59570	1.60588
20	1.50177	1.51216	1.53706	1.54504	1.55132	1.56959	1.57989
21	1.47595	1.48645	1.51163	1.51970	1.52605	1.54452	1.55493
22	1.45107	1.46169	1.48715	1.49530	1.50171	1.52038	1.53090
23	1.42706	1.43780	1.46352	1.47176	1.47824	1.49710	1.50773
24	1.40385	1.41470	1.44068	1.44901	1.45555	1.47460	1.48533
25	1.38137	1.39233	1.41858	1.42698	1.43359	1.45283	1.46366
26	1.35956	1.37063	1.39714	1.40563	1.41230	1.43172	1.44266
27	1.33839	1.34957	1.37633	1.38490	1.39163	1.41124	1.42227
28	1.31780	1.32908	1.35610	1.36475	1.37154	1.39132	1.40246
29	1.29775	1.30914	1.33641	1.34513	1.35199	1.37195	1.38319
30	1.27822	1.28971	1.31722	1.32603	1.33295	1.35308	1.36441
31	1.25916	1.27076	1.29851	1.30739	1.31437	1.33468	1.34611
32	1.24054	1.25225	1.28024	1.28920	1.29624	1.31672	1.32824
33	1.22235	1.23415	1.26239	1.27143	1.27853	1.29917	1.31079
34	1.20455	1.21646	1.24494	1.25405	1.26120	1.28202	1.29373
35	1.18713	1.19914	1.22785	1.23704	1.24425	1.26524	1.27704
36	1.17006	1.18217	1.21112	1.22038	1.22765	1.24880	1.26070
37	1.15332	1.16553	1.19472	1.20405	1.21138	1.23270	1.24469
38	1.13691	1.14921	1.17863	1.18804	1.19543	1.21691	1.22899
39	1.12079	1.13320	1.16285	1.17233	1.17977	1.20142	1.21359
40	1.10496	1.11746	1.14735	1.15690	1.16440	1.18621	1.19847
41	1.08940	1.10200	1.13212	1.14174	1.14930	1.17127	1.18362
42	1.07410	1.08680	1.11714	1.12684	1.13445	1.15658	1.16903
43	1.05905	1.07185	1.10242	1.11219	1.11986	1.14215	1.15468
44	1.04423	1.05713	1.08793	1.09777	1.10549	1.12795	1.14056
45	1.02964	1.04264	1.07366	1.08357	1.09136	1.11397	1.12667
46	1.01527	1.02836	1.05961	1.06960	1.07743	1.10020	1.11300
47	1.00110	1.01429	1.04577	1.05582	1.06372	1.08664	1.09953
48	0.98714	1.00042	1.03213	1.04225	1.05020	1.07328	1.08625
49	0.97336	0.98674	1.01867	1.02886	1.03687	1.06011	1.07317
50	0.95976	0.97324	1.00540	1.01566	1.02372	1.04712	1.06026

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	294	300	315	320	324	336	343
51	0.94634	0.95991	0.99230	1.00263	1.01074	1.03430	1.04753
52	0.93309	0.94676	0.97937	0.98977	0.99794	1.02165	1.03497
53	0.92000	0.93376	0.96660	0.97707	0.98530	1.00917	1.02257
54	0.90706	0.92093	0.95398	0.96453	0.97281	0.99683	1.01032
55	0.89428	0.90824	0.94152	0.95214	0.96047	0.98465	0.99823
56	0.88164	0.89570	0.92920	0.93989	0.94828	0.97261	0.98628
57	0.86914	0.88329	0.91702	0.92778	0.93622	0.96072	0.97446
58	0.85678	0.87102	0.90498	0.91581	0.92430	0.94895	0.96279
59	0.84454	0.85888	0.89306	0.90396	0.91251	0.93732	0.95124
60	0.83243	0.84687	0.88127	0.89224	0.90085	0.92581	0.93982
61	0.82044	0.83498	0.86961	0.88064	0.88930	0.91442	0.92852
62	0.80857	0.82320	0.85806	0.86916	0.87788	0.90316	0.91733
63	0.79681	0.81154	0.84662	0.85780	0.86657	0.89200	0.90626
64	0.78516	0.79998	0.83529	0.84654	0.85537	0.88095	0.89530
65	0.77361	0.78854	0.82407	0.83539	0.84427	0.87001	0.88445
66	0.76217	0.77719	0.81295	0.82434	0.83328	0.85918	0.87370
67	0.75082	0.76595	0.80193	0.81340	0.82238	0.84844	0.86305
68	0.73958	0.75480	0.79101	0.80254	0.81159	0.83780	0.85250
69	0.72842	0.74374	0.78018	0.79179	0.80089	0.82726	0.84204
70	0.71736	0.73277	0.76945	0.78112	0.79027	0.81680	0.83167
71	0.70638	0.72189	0.75880	0.77054	0.77975	0.80644	0.82139
72	0.69548	0.71110	0.74823	0.76005	0.76931	0.79616	0.81120
73	0.68467	0.70039	0.73775	0.74964	0.75896	0.78596	0.80109
74	0.67394	0.68976	0.72735	0.73931	0.74869	0.77585	0.79106
75	0.66329	0.67920	0.71703	0.72906	0.73849	0.76581	0.78111
76	0.65271	0.66872	0.70678	0.71889	0.72837	0.75585	0.77124
77	0.64220	0.65831	0.69661	0.70879	0.71833	0.74597	0.76145
78	0.63176	0.64798	0.68651	0.69876	0.70836	0.73616	0.75172
79	0.62139	0.63771	0.67647	0.68880	0.69845	0.72641	0.74207
80	0.61109	0.62751	0.66651	0.67891	0.68862	0.71674	0.73248
81	0.60085	0.61738	0.65661	0.66908	0.67885	0.70713	0.72296
82	0.59068	0.60730	0.64678	0.65932	0.66915	0.69759	0.71351
83	0.58056	0.59729	0.63701	0.64962	0.65951	0.68811	0.70412
84	0.57051	0.58734	0.62729	0.63998	0.64993	0.67870	0.69479
85	0.56051	0.57745	0.61764	0.63041	0.64040	0.66934	0.68552
86	0.55057	0.56761	0.60804	0.62088	0.63094	0.66004	0.67631
87	0.54068	0.55783	0.59851	0.61142	0.62153	0.65080	0.66716
88	0.53085	0.54810	0.58902	0.60201	0.61218	0.64161	0.65806
89	0.52106	0.53842	0.57959	0.59265	0.60288	0.63248	0.64902
90	0.51133	0.52879	0.57020	0.58335	0.59364	0.62339	0.64003
91	0.50164	0.51922	0.56087	0.57409	0.58444	0.61436	0.63109
92	0.49200	0.50968	0.55159	0.56488	0.57529	0.60538	0.62220
93	0.48241	0.50020	0.54235	0.55572	0.56619	0.59645	0.61336
94	0.47286	0.49076	0.53316	0.54661	0.55714	0.58757	0.60457
95	0.46335	0.48136	0.52402	0.53754	0.54813	0.57873	0.59583
96	0.45389	0.47201	0.51492	0.52852	0.53917	0.56994	0.58713
97	0.44446	0.46269	0.50586	0.51954	0.53025	0.56119	0.57847
98	0.43508	0.45342	0.49684	0.51060	0.52137	0.55248	0.56986
99	0.42573	0.44419	0.48786	0.50170	0.51253	0.54382	0.56129
100	0.41642	0.43499	0.47893	0.49284	0.50374	0.53519	0.55276

k \ n	294	300	315	320	324	336	343
101	0.40715	0.42583	0.47003	0.48402	0.49498	0.52661	0.54427
102	0.39791	0.41670	0.46116	0.47524	0.48626	0.51806	0.53582
103	0.38870	0.40761	0.45234	0.46649	0.47757	0.50956	0.52740
104	0.37953	0.39856	0.44354	0.45778	0.46892	0.50109	0.51903
105	0.37039	0.38953	0.43479	0.44911	0.46031	0.49265	0.51069
106	0.36128	0.38054	0.42606	0.44047	0.45173	0.48425	0.50239
107	0.35220	0.37158	0.41737	0.43186	0.44319	0.47588	0.49412
108	0.34315	0.36265	0.40871	0.42328	0.43467	0.46755	0.48588
109	0.33413	0.35375	0.40008	0.41473	0.42619	0.45925	0.47768
110	0.32513	0.34487	0.39148	0.40622	0.41774	0.45098	0.46951
111	0.31616	0.33602	0.38291	0.39773	0.40932	0.44274	0.46137
112	0.30722	0.32720	0.37436	0.38927	0.40093	0.43453	0.45326
113	0.29830	0.31841	0.36585	0.38084	0.39256	0.42635	0.44518
114	0.28940	0.30963	0.35736	0.37244	0.38422	0.41820	0.43713
115	0.28053	0.30089	0.34889	0.36406	0.37591	0.41008	0.42911
116	0.27168	0.29216	0.34046	0.35571	0.36763	0.40198	0.42112
117	0.26285	0.28346	0.33204	0.34738	0.35937	0.39391	0.41315
118	0.25404	0.27478	0.32365	0.33908	0.35113	0.38587	0.40521
119	0.24525	0.26612	0.31528	0.33080	0.34292	0.37785	0.39729
120	0.23648	0.25748	0.30693	0.32254	0.33473	0.36985	0.38940
121	0.22773	0.24885	0.29861	0.31431	0.32657	0.36188	0.38153
122	0.21899	0.24025	0.29030	0.30609	0.31842	0.35393	0.37369
123	0.21027	0.23167	0.28202	0.29790	0.31030	0.34601	0.36587
124	0.20157	0.22310	0.27375	0.28972	0.30220	0.33810	0.35807
125	0.19288	0.21455	0.26551	0.28157	0.29411	0.33022	0.35030
126	0.18421	0.20601	0.25728	0.27343	0.28605	0.32235	0.34254
127	0.17555	0.19749	0.24907	0.26532	0.27800	0.31451	0.33481
128	0.16691	0.18898	0.24087	0.25722	0.26998	0.30669	0.32709
129	0.15827	0.18049	0.23270	0.24913	0.26197	0.29888	0.31940
130	0.14965	0.17201	0.22453	0.24107	0.25397	0.29109	0.31172
131	0.14104	0.16354	0.21638	0.23302	0.24600	0.28333	0.30406
132	0.13244	0.15508	0.20825	0.22498	0.23804	0.27557	0.29642
133	0.12385	0.14664	0.20013	0.21696	0.23009	0.26784	0.28880
134	0.11527	0.13820	0.19202	0.20895	0.22216	0.26012	0.28119
135	0.10670	0.12978	0.18393	0.20096	0.21424	0.25241	0.27360
136	0.09813	0.12136	0.17585	0.19298	0.20634	0.24472	0.26603
137	0.08958	0.11296	0.16778	0.18501	0.19845	0.23705	0.25847
138	0.08103	0.10456	0.15972	0.17705	0.19057	0.22939	0.25092
139	0.07248	0.09617	0.15167	0.16910	0.18270	0.22174	0.24339
140	0.06394	0.08778	0.14363	0.16117	0.17484	0.21410	0.23588
141	0.05541	0.07940	0.13560	0.15324	0.16700	0.20648	0.22837
142	0.04688	0.07103	0.12758	0.14533	0.15916	0.19887	0.22088
143	0.03835	0.06266	0.11957	0.13742	0.15134	0.19127	0.21341
144	0.02982	0.05430	0.11156	0.12952	0.14352	0.18369	0.20594
145	0.02130	0.04594	0.10356	0.12163	0.13571	0.17611	0.19849
146	0.01278	0.03758	0.09557	0.11375	0.12792	0.16854	0.19104
147	0.00426	0.02923	0.08759	0.10587	0.12012	0.16098	0.18361
148		0.02088	0.07961	0.09801	0.11234	0.15344	0.17619
149		0.01252	0.07163	0.09014	0.10456	0.14590	0.16878
150		0.00417	0.06366	0.08229	0.09679	0.13837	0.16137

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	294	300	315	320	324	336	343
151			0.05569	0.07443	0.08903	0.13084	0.15398
152			0.04773	0.06659	0.08127	0.12333	0.14659
153			0.03977	0.05874	0.07351	0.11582	0.13921
154			0.03181	0.05090	0.06576	0.10832	0.13184
155			0.02386	0.04307	0.05802	0.10082	0.12448
156			0.01590	0.03523	0.05028	0.09333	0.11712
157			0.00795	0.02740	0.04254	0.08584	0.10977
158			0.00000	0.01957	0.03480	0.07836	0.10243
159				0.01174	0.02706	0.07089	0.09509
160				0.00391	0.01933	0.06341	0.08775
161					0.01160	0.05594	0.08042
162					0.00387	0.04848	0.07310
163						0.04102	0.06578
164						0.03356	0.05846
165						0.02610	0.05115
166						0.01864	0.04383
167						0.01118	0.03652
168						0.00373	0.02922
169							0.02191
170							0.01461
171							0.00730
172							0.00000

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	350	360	375	378	384	392	400
1	2.92651	2.93534	2.94810	2.95059	2.95549	2.96191	2.96818
2	2.61207	2.62173	2.63568	2.63840	2.64376	2.65077	2.65761
3	2.44004	2.45024	2.46495	2.46781	2.47346	2.48084	2.48806
4	2.31904	2.32964	2.34494	2.34792	2.35379	2.36147	2.36897
5	2.22462	2.23557	2.25136	2.25443	2.26049	2.26841	2.27615
6	2.14663	2.15788	2.17410	2.17725	2.18348	2.19161	2.19955
7	2.07985	2.09137	2.10797	2.11120	2.11757	2.12589	2.13402
8	2.02122	2.03299	2.04995	2.05325	2.05975	2.06825	2.07654
9	1.96882	1.98082	1.99810	2.00146	2.00809	2.01675	2.02521
10	1.92133	1.93354	1.95113	1.95455	1.96130	1.97011	1.97871
11	1.87781	1.89022	1.90811	1.91158	1.91844	1.92739	1.93614
12	1.83758	1.85019	1.86835	1.87188	1.87885	1.88793	1.89681
13	1.80013	1.81292	1.83135	1.83493	1.84199	1.85121	1.86021
14	1.76504	1.77802	1.79670	1.80033	1.80749	1.81683	1.82595
15	1.73201	1.74515	1.76408	1.76776	1.77501	1.78448	1.79371
16	1.70076	1.71407	1.73324	1.73696	1.74431	1.75389	1.76324
17	1.67109	1.68457	1.70396	1.70773	1.71516	1.72486	1.73432
18	1.64283	1.65646	1.67608	1.67989	1.68741	1.69721	1.70678
19	1.61582	1.62961	1.64945	1.65330	1.66090	1.67081	1.68048
20	1.58994	1.60388	1.62393	1.62783	1.63551	1.64552	1.65530
21	1.56508	1.57917	1.59943	1.60337	1.61113	1.62125	1.63112
22	1.54116	1.55539	1.57586	1.57983	1.58767	1.59789	1.60786
23	1.51809	1.53246	1.55313	1.55714	1.56506	1.57537	1.58544
24	1.49580	1.51031	1.53118	1.53523	1.54322	1.55363	1.56379
25	1.47423	1.48888	1.50994	1.51403	1.52209	1.53260	1.54285
26	1.45332	1.46811	1.48936	1.49349	1.50162	1.51222	1.52257
27	1.43303	1.44795	1.46940	1.47356	1.48176	1.49246	1.50289
28	1.41332	1.42837	1.45000	1.45420	1.46247	1.47326	1.48378
29	1.39414	1.40932	1.43114	1.43537	1.44371	1.45459	1.46520
30	1.37546	1.39077	1.41277	1.41703	1.42545	1.43641	1.44711
31	1.35725	1.37268	1.39486	1.39917	1.40765	1.41870	1.42948
32	1.33947	1.35504	1.37740	1.38173	1.39028	1.40142	1.41228
33	1.32211	1.33780	1.36034	1.36471	1.37332	1.38455	1.39550
34	1.30515	1.32096	1.34367	1.34807	1.35675	1.36807	1.37910
35	1.28854	1.30448	1.32737	1.33180	1.34055	1.35195	1.36306
36	1.27229	1.28835	1.31141	1.31588	1.32469	1.33617	1.34736
37	1.25637	1.27255	1.29578	1.30028	1.30915	1.32072	1.33199
38	1.24076	1.25706	1.28045	1.28499	1.29393	1.30558	1.31693
39	1.22544	1.24186	1.26543	1.27000	1.27900	1.29073	1.30216
40	1.21041	1.22695	1.25068	1.25529	1.26435	1.27616	1.28767
41	1.19565	1.21230	1.23621	1.24084	1.24997	1.26186	1.27344
42	1.18114	1.19792	1.22198	1.22665	1.23584	1.24781	1.25947
43	1.16688	1.18377	1.20800	1.21270	1.22195	1.23400	1.24574
44	1.15285	1.16986	1.19425	1.19898	1.20830	1.22043	1.23225
45	1.13904	1.15617	1.18073	1.18549	1.19486	1.20707	1.21897
46	1.12545	1.14269	1.16742	1.17221	1.18164	1.19393	1.20590
47	1.11207	1.12942	1.15431	1.15913	1.16863	1.18099	1.19304
48	1.09888	1.11635	1.14139	1.14625	1.15580	1.16825	1.18037
49	1.08587	1.10346	1.12867	1.13355	1.14317	1.15569	1.16789
50	1.07305	1.09075	1.11612	1.12104	1.13071	1.14332	1.15559

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	350	360	375	378	384	392	400
51	1.06041	1.07822	1.10375	1.10870	1.11843	1.13111	1.14346
52	1.04793	1.06586	1.09155	1.09652	1.10632	1.11907	1.13149
53	1.03561	1.05365	1.07950	1.08451	1.09436	1.10720	1.11969
54	1.02345	1.04160	1.06761	1.07265	1.08256	1.09547	1.10804
55	1.01144	1.02970	1.05587	1.06094	1.07091	1.08390	1.09654
56	0.99957	1.01795	1.04427	1.04937	1.05940	1.07247	1.08518
57	0.98784	1.00633	1.03281	1.03794	1.04804	1.06117	1.07396
58	0.97624	0.99485	1.02149	1.02665	1.03680	1.05001	1.06287
59	0.96478	0.98350	1.01030	1.01548	1.02569	1.03898	1.05192
60	0.95344	0.97227	0.99923	1.00444	1.01471	1.02808	1.04108
61	0.94222	0.96116	0.98828	0.99353	1.00386	1.01730	1.03037
62	0.93112	0.95017	0.97745	0.98272	0.99311	1.00663	1.01978
63	0.92013	0.93930	0.96673	0.97204	0.98248	0.99608	1.00930
64	0.90925	0.92853	0.95612	0.96146	0.97197	0.98563	0.99893
65	0.89848	0.91788	0.94562	0.95099	0.96155	0.97529	0.98866
66	0.88782	0.90732	0.93522	0.94062	0.95124	0.96506	0.97850
67	0.87725	0.89687	0.92493	0.93035	0.94103	0.95493	0.96844
68	0.86678	0.88651	0.91473	0.92018	0.93092	0.94489	0.95848
69	0.85640	0.87625	0.90462	0.91011	0.92091	0.93495	0.94861
70	0.84612	0.86607	0.89461	0.90012	0.91098	0.92510	0.93883
71	0.83592	0.85599	0.88468	0.89023	0.90114	0.91534	0.92914
72	0.82581	0.84599	0.87484	0.88042	0.89139	0.90566	0.91954
73	0.81579	0.83608	0.86509	0.87069	0.88173	0.89607	0.91002
74	0.80584	0.82625	0.85541	0.86105	0.87214	0.88656	0.90058
75	0.79598	0.81650	0.84582	0.85149	0.86264	0.87713	0.89122
76	0.78619	0.80682	0.83630	0.84200	0.85321	0.86778	0.88194
77	0.77648	0.79722	0.82686	0.83259	0.84386	0.85850	0.87274
78	0.76684	0.78770	0.81749	0.82325	0.83458	0.84930	0.86361
79	0.75727	0.77824	0.80820	0.81398	0.82537	0.84017	0.85455
80	0.74777	0.76885	0.79897	0.80479	0.81623	0.83110	0.84556
81	0.73833	0.75953	0.78981	0.79566	0.80716	0.82211	0.83663
82	0.72896	0.75028	0.78071	0.78659	0.79816	0.81318	0.82778
83	0.71966	0.74109	0.77168	0.77759	0.78922	0.80432	0.81899
84	0.71041	0.73196	0.76272	0.76866	0.78034	0.79551	0.81026
85	0.70123	0.72289	0.75381	0.75978	0.77152	0.78677	0.80159
86	0.69211	0.71389	0.74496	0.75096	0.76276	0.77809	0.79298
87	0.68304	0.70494	0.73617	0.74221	0.75406	0.76947	0.78443
88	0.67403	0.69604	0.72744	0.73350	0.74542	0.76090	0.77594
89	0.66507	0.68720	0.71876	0.72486	0.73684	0.75239	0.76750
90	0.65617	0.67842	0.71014	0.71626	0.72830	0.74394	0.75912
91	0.64732	0.66968	0.70157	0.70772	0.71982	0.73554	0.75079
92	0.63852	0.66100	0.69305	0.69923	0.71139	0.72718	0.74252
93	0.62976	0.65236	0.68458	0.69080	0.70302	0.71888	0.73429
94	0.62106	0.64378	0.67616	0.68241	0.69469	0.71063	0.72611
95	0.61240	0.63524	0.66778	0.67406	0.68640	0.70243	0.71798
96	0.60379	0.62675	0.65946	0.66577	0.67817	0.69427	0.70990
97	0.59522	0.61830	0.65118	0.65752	0.66998	0.68616	0.70186
98	0.58670	0.60990	0.64294	0.64931	0.66184	0.67809	0.69387
99	0.57822	0.60154	0.63475	0.64115	0.65374	0.67007	0.68593
100	0.56978	0.59322	0.62659	0.63303	0.64568	0.66209	0.67802

EXPECTED VALUES OF NORMAL ORDER STATISTICS

k \ n	350	360	375	378	384	392	400
101	0.56138	0.58494	0.61849	0.62495	0.63766	0.65416	0.67016
102	0.55302	0.57670	0.61042	0.61692	0.62969	0.64626	0.66234
103	0.54470	0.56850	0.60239	0.60892	0.62175	0.63841	0.65456
104	0.53641	0.56034	0.59440	0.60096	0.61386	0.63059	0.64682
105	0.52817	0.55222	0.58644	0.59304	0.60600	0.62281	0.63912
106	0.51996	0.54413	0.57853	0.58515	0.59818	0.61507	0.63145
107	0.51178	0.53608	0.57065	0.57731	0.59039	0.60737	0.62383
108	0.50364	0.52806	0.56280	0.56950	0.58264	0.59970	0.61624
109	0.49553	0.52008	0.55499	0.56172	0.57493	0.59206	0.60868
110	0.48745	0.51213	0.54721	0.55397	0.56725	0.58447	0.60116
111	0.47941	0.50421	0.53947	0.54626	0.55960	0.57690	0.59367
112	0.47139	0.49632	0.53176	0.53858	0.55199	0.56937	0.58622
113	0.46341	0.48847	0.52408	0.53094	0.54441	0.56187	0.57880
114	0.45545	0.48064	0.51643	0.52332	0.53685	0.55440	0.57141
115	0.44753	0.47285	0.50881	0.51574	0.52933	0.54696	0.56405
116	0.43963	0.46508	0.50122	0.50818	0.52184	0.53955	0.55672
117	0.43176	0.45734	0.49366	0.50065	0.51438	0.53218	0.54942
118	0.42392	0.44962	0.48613	0.49316	0.50695	0.52483	0.54215
119	0.41610	0.44194	0.47862	0.48568	0.49954	0.51751	0.53491
120	0.40831	0.43428	0.47115	0.47824	0.49217	0.51021	0.52770
121	0.40054	0.42664	0.46369	0.47082	0.48482	0.50295	0.52051
122	0.39280	0.41903	0.45627	0.46343	0.47749	0.49571	0.51335
123	0.38508	0.41145	0.44887	0.45606	0.47019	0.48849	0.50622
124	0.37738	0.40389	0.44149	0.44872	0.46292	0.48130	0.49911
125	0.36970	0.39635	0.43414	0.44140	0.45567	0.47414	0.49203
126	0.36205	0.38883	0.42681	0.43411	0.44844	0.46700	0.48497
127	0.35442	0.38134	0.41950	0.42684	0.44124	0.45989	0.47794
128	0.34681	0.37386	0.41222	0.41959	0.43406	0.45279	0.47093
129	0.33922	0.36641	0.40495	0.41236	0.42690	0.44572	0.46394
130	0.33164	0.35898	0.39771	0.40516	0.41976	0.43868	0.45698
131	0.32409	0.35157	0.39049	0.39797	0.41265	0.43165	0.45004
132	0.31656	0.34417	0.38329	0.39081	0.40556	0.42464	0.44312
133	0.30904	0.33680	0.37611	0.38367	0.39848	0.41766	0.43622
134	0.30154	0.32945	0.36895	0.37654	0.39143	0.41070	0.42934
135	0.29406	0.32211	0.36181	0.36944	0.38439	0.40375	0.42248
136	0.28659	0.31479	0.35469	0.36235	0.37738	0.39683	0.41564
137	0.27914	0.30748	0.34758	0.35528	0.37038	0.38992	0.40883
138	0.27171	0.30019	0.34049	0.34823	0.36340	0.38304	0.40203
139	0.26429	0.29292	0.33342	0.34120	0.35644	0.37617	0.39524
140	0.25689	0.28567	0.32637	0.33418	0.34950	0.36932	0.38848
141	0.24950	0.27843	0.31933	0.32718	0.34257	0.36248	0.38174
142	0.24212	0.27120	0.31231	0.32020	0.33566	0.35567	0.37501
143	0.23475	0.26399	0.30530	0.31323	0.32877	0.34887	0.36830
144	0.22740	0.25679	0.29831	0.30628	0.32189	0.34208	0.36160
145	0.22006	0.24960	0.29133	0.29934	0.31503	0.33532	0.35492
146	0.21274	0.24243	0.28437	0.29241	0.30818	0.32856	0.34826
147	0.20542	0.23527	0.27742	0.28550	0.30134	0.32182	0.34161
148	0.19812	0.22812	0.27048	0.27861	0.29452	0.31510	0.33498
149	0.19082	0.22098	0.26356	0.27172	0.28772	0.30839	0.32836
150	0.18354	0.21386	0.25665	0.26485	0.28092	0.30170	0.32176

k \ n	350	360	375	378	384	392	400
151	0.17626	0.20675	0.24975	0.25799	0.27414	0.29501	0.31517
152	0.16900	0.19964	0.24287	0.25115	0.26738	0.28834	0.30860
153	0.16174	0.19255	0.23599	0.24431	0.26062	0.28169	0.30203
154	0.15450	0.18546	0.22913	0.23749	0.25388	0.27505	0.29548
155	0.14726	0.17839	0.22227	0.23068	0.24714	0.26841	0.28895
156	0.14003	0.17132	0.21543	0.22388	0.24042	0.26179	0.28242
157	0.13280	0.16427	0.20860	0.21709	0.23371	0.25519	0.27591
158	0.12558	0.15722	0.20178	0.21031	0.22701	0.24859	0.26941
159	0.11837	0.15017	0.19496	0.20354	0.22032	0.24200	0.26292
160	0.11117	0.14314	0.18816	0.19677	0.21365	0.23543	0.25644
161	0.10397	0.13611	0.18136	0.19002	0.20698	0.22886	0.24998
162	0.09678	0.12909	0.17458	0.18328	0.20031	0.22231	0.24352
163	0.08959	0.12208	0.16780	0.17654	0.19366	0.21576	0.23707
164	0.08240	0.11507	0.16103	0.16981	0.18702	0.20922	0.23064
165	0.07522	0.10807	0.15426	0.16309	0.18038	0.20269	0.22421
166	0.06805	0.10107	0.14750	0.15638	0.17376	0.19618	0.21779
167	0.06088	0.09408	0.14075	0.14968	0.16714	0.18966	0.21138
168	0.05371	0.08709	0.13401	0.14298	0.16053	0.18316	0.20498
169	0.04654	0.08011	0.12727	0.13628	0.15392	0.17667	0.19859
170	0.03938	0.07313	0.12054	0.12960	0.14732	0.17018	0.19220
171	0.03221	0.06616	0.11381	0.12292	0.14073	0.16370	0.18583
172	0.02505	0.05918	0.10709	0.11624	0.13414	0.15722	0.17946
173	0.01789	0.05221	0.10038	0.10957	0.12756	0.15076	0.17310
174	0.01074	0.04525	0.09366	0.10291	0.12099	0.14430	0.16674
175	0.00358	0.03828	0.08696	0.09625	0.11442	0.13784	0.16040
176		0.03132	0.08025	0.08959	0.10786	0.13139	0.15406
177		0.02436	0.07355	0.08294	0.10130	0.12495	0.14772
178		0.01740	0.06685	0.07629	0.09474	0.11851	0.14139
179		0.01044	0.06016	0.06965	0.08819	0.11208	0.13507
180		0.00348	0.05347	0.06300	0.08164	0.10565	0.12875
181			0.04678	0.05636	0.07510	0.09922	0.12244
182			0.04009	0.04973	0.06856	0.09280	0.11613
183			0.03341	0.04309	0.06202	0.08639	0.10983
184			0.02673	0.03646	0.05548	0.07997	0.10353
185			0.02004	0.02983	0.04895	0.07356	0.09723
186			0.01336	0.02320	0.04242	0.06716	0.09094
187			0.00668	0.01657	0.03589	0.06075	0.08465
188			0.00000	0.00994	0.02936	0.05435	0.07837
189				0.00331	0.02284	0.04795	0.07209
190					0.01631	0.04155	0.06581
191					0.00979	0.03516	0.05954
192					0.00326	0.02876	0.05326
193						0.02237	0.04699
194						0.01598	0.04072
195						0.00959	0.03445
196						0.00320	0.02819
197							0.02192
198							0.01566
199							0.00939
200							0.00313

Blom's Approximation

$$[\Phi(x) = \int_{-\infty}^{x} \phi(x)dx, \text{ with } \phi(x)=(2\pi)^{-1/2} e^{-x^2/2}]$$

B. Values of $\alpha_{i,n}$ such that $E(x_i) = \Phi^{-1}[(i-\alpha_{i,n}) / (n-2\alpha_{i,n}+1)]$

i	n=25	n=50	n=100	n=200	n=400	i	n=100	n=200	n=400
1	0.377	0.384	0.391	0.396	0.401	30	0.394	0.404	0.414
2	0.394	0.403	0.412	0.419	0.426	35	0.393	0.402	0.412
3	0.395	0.405	0.415	0.423	0.430	40	0.392	0.400	0.410
4	0.394	0.405	0.415	0.424	0.431	45	0.391	0.398	0.408
5	0.392	0.403	0.414	0.423	0.431	50	0.391	0.397	0.407
6	0.391	0.402	0.412	0.422	0.430	55		0.396	0.405
7	0.390	0.400	0.411	0.421	0.429	60		0.395	0.404
8	0.389	0.399	0.410	0.420	0.429	65		0.394	0.403
9	0.388	0.398	0.408	0.418	0.428	70		0.394	0.402
10	0.388	0.397	0.407	0.417	0.427	75		0.393	0.401
11	0.387	0.396	0.406	0.416	0.426	80		0.393	0.400
12	0.387	0.395	0.405	0.415	0.425	85		0.392	0.399
13		0.394	0.404	0.414	0.424	90		0.392	0.399
14		0.393	0.403	0.414	0.423	95		0.391	0.398
15		0.393	0.402	0.413	0.423	100		0.391	0.398
16		0.392	0.402	0.412	0.422	110			0.396
17		0.392	0.401	0.411	0.421	120			0.396
18		0.391	0.400	0.410	0.420	130			0.395
19		0.391	0.399	0.410	0.420	140			0.394
20		0.391	0.399	0.409	0.419	150			0.394
21		0.390	0.398	0.408	0.419	160			0.393
22		0.390	0.398	0.408	0.418	170			0.393
23		0.390	0.397	0.407	0.417	180			0.392
24		0.390	0.397	0.407	0.417	190			0.392
25		0.390	0.396	0.406	0.416	200			0.391

C. Compromise Values of α

n	α_n	$\alpha_{1,n}$	$\alpha_{2,n}$
2	0.330	0.330	
4	0.349	0.347	0.359
6	0.359	0.355	0.368
8	0.364	0.360	0.374
10	0.368	0.364	0.378
15	0.374	0.370	0.385
20	0.378	0.374	0.390
25	0.381	0.377	0.394
50	0.389	0.384	0.403
100	0.396	0.391	0.412
200	0.402	0.396	0.419
400	0.407	0.401	0.426

To estimate α for intermediate values of n, use the following equations:

$$\alpha_n = .314195 + .063336X - .010895X^2$$

$$\alpha_{1,n} = .315065 + .057974X - .009776X^2$$

$$\alpha_{2,n} = .327511 + .058212X - .007909X^2$$

where $X = \log_{10} n$

Table C2

EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

[$E(x_{M,N})$, where $x_{M,N}$ is the Mth order statistic of a sample of size N from an exponential population with location parameter 0 and scale parameter 1]

EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

M \ N	1	2	3	4	5	6	7	8
1	1.00000	0.50000	0.33333	0.25000	0.20000	0.16667	0.14286	0.12500
2		1.50000	0.83333	0.58333	0.45000	0.36667	0.30952	0.26786
3			1.83333	1.08333	0.78333	0.61667	0.50952	0.43452
4				2.08333	1.28333	0.95000	0.75952	0.63452
5					2.28333	1.45000	1.09286	0.88452
6						2.45000	1.59286	1.21786
7							2.59286	1.71786
8								2.71786

M \ N	9	10	11	12	13	14	15	16
1	0.11111	0.10000	0.09091	0.08333	0.07692	0.07143	0.06667	0.06250
2	0.23611	0.21111	0.19091	0.17424	0.16026	0.14835	0.13810	0.12917
3	0.37897	0.33611	0.30202	0.27424	0.25117	0.23168	0.21502	0.20060
4	0.54563	0.47897	0.42702	0.38535	0.35117	0.32259	0.29835	0.27752
5	0.74563	0.64563	0.56988	0.51035	0.46228	0.42259	0.38926	0.36085
6	0.99563	0.84563	0.73654	0.65321	0.58728	0.53371	0.48926	0.45176
7	1.32897	1.09563	0.93654	0.81988	0.73013	0.65871	0.60037	0.55176
8	1.82897	1.42897	1.18654	1.01988	0.89680	0.80156	0.72537	0.66287

M \ N	9	10	11	12	13	14	15	16
9	2.82897	1.92897	1.51988	1.26988	1.09680	0.96823	0.86823	0.78787
10		2.92897	2.01988	1.60321	1.34680	1.16823	1.03490	0.93073
11			3.01988	2.10321	1.68013	1.41823	1.23490	1.09740
12				3.10321	2.18013	1.75156	1.48490	1.29740
13					3.18013	2.25156	1.81823	1.54740
14						3.25156	2.31823	1.88073
15							3.31823	2.38073
16								3.38073

M \ N	17	18	19	20	21	22	23	24
1	0.05882	0.05556	0.05263	0.05000	0.04762	0.04545	0.04348	0.04167
2	0.12132	0.11438	0.10819	0.10263	0.09762	0.09307	0.08893	0.08514
3	0.18799	0.17688	0.16701	0.15819	0.15025	0.14307	0.13655	0.13060
4	0.25942	0.24355	0.22951	0.21701	0.20581	0.19571	0.18655	0.17822
5	0.33634	0.31497	0.29618	0.27951	0.26463	0.25126	0.23918	0.22822
6	0.41968	0.39190	0.36761	0.34618	0.32713	0.31008	0.29474	0.28085
7	0.51058	0.47523	0.44453	0.41761	0.39380	0.37258	0.35356	0.33641
8	0.61058	0.56614	0.52786	0.49453	0.46522	0.43925	0.41606	0.39523

M \ N	17	18	19	20	21	22	23	24
9	0.72170	0.66614	0.61877	0.57786	0.54215	0.51068	0.48273	0.45773
10	0.84670	0.77725	0.71877	0.66877	0.62548	0.58760	0.55416	0.52440
11	0.98955	0.90225	0.82988	0.76877	0.71639	0.67094	0.63108	0.59582
12	1.15622	1.04511	0.95488	0.87988	0.81639	0.76184	0.71441	0.67275
13	1.35622	1.21177	1.09774	1.00488	0.92750	0.86184	0.80532	0.75608
14	1.60622	1.41177	1.26441	1.14774	1.05250	0.97296	0.90532	0.84699
15	1.93955	1.66177	1.46441	1.31441	1.19536	1.09796	1.01643	0.94699
16	2.43955	1.99511	1.71441	1.51441	1.36203	1.24081	1.14143	1.05810

M \ N	17	18	19	20	21	22	23	24
17	3.43955	2.49511	2.04774	1.76441	1.56203	1.40748	1.28429	1.18310
18		3.49511	2.54774	2.09774	1.81203	1.60748	1.45096	1.32596
19			3.54774	2.59774	2.14536	1.85748	1.65096	1.49262
20				3.59774	2.64536	2.19081	1.90096	1.69262
21					3.64536	2.69081	2.23429	1.94262
22						3.69081	2.73429	2.27596
23							3.73429	2.77596
24								3.77596

M \ N	25	26	27	28	29	30	31	32
1	0.04000	0.03846	0.03704	0.03571	0.03448	0.03333	0.03226	0.03125
2	0.08167	0.07846	0.07550	0.07275	0.07020	0.06782	0.06559	0.06351
3	0.12514	0.12013	0.11550	0.11121	0.10723	0.10353	0.10007	0.09684
4	0.17060	0.16361	0.15717	0.15121	0.14570	0.14057	0.13579	0.13132
5	0.21822	0.20906	0.20064	0.19288	0.18570	0.17903	0.17283	0.16704
6	0.26822	0.25668	0.24610	0.23636	0.22736	0.21903	0.21129	0.20408
7	0.32085	0.30668	0.29372	0.28181	0.27084	0.26070	0.25129	0.24254
8	0.37641	0.35931	0.34372	0.32943	0.31630	0.30417	0.29295	0.28254

M \ N	25	26	27	28	29	30	31	32
9	0.43523	0.41487	0.39635	0.37943	0.36391	0.34963	0.33643	0.32420
10	0.49773	0.47369	0.45190	0.43206	0.41391	0.39725	0.38189	0.36768
11	0.56440	0.53619	0.51073	0.48762	0.46655	0.44725	0.42951	0.41314
12	0.63582	0.60286	0.57323	0.54644	0.52210	0.49988	0.47951	0.46076
13	0.71275	0.67429	0.63989	0.60894	0.58092	0.55543	0.53214	0.51076
14	0.79608	0.75121	0.71132	0.67561	0.64342	0.61426	0.58769	0.56339
15	0.88699	0.83454	0.78825	0.74704	0.71009	0.67676	0.64652	0.61894
16	0.98699	0.92545	0.87158	0.82396	0.78152	0.74342	0.70902	0.67777

M \ N	25	26	27	28	29	30	31	32
17	1.09810	1.02545	0.96249	0.90729	0.85844	0.81485	0.77568	0.74027
18	1.22310	1.13656	1.06249	0.99820	0.94178	0.89178	0.84711	0.80693
19	1.36596	1.26156	1.17360	1.09820	1.03269	0.97511	0.92403	0.87836
20	1.53262	1.40442	1.29860	1.20931	1.13269	1.06602	1.00737	0.95528
21	1.73262	1.57109	1.44146	1.33431	1.24380	1.16602	1.09828	1.03862
22	1.98262	1.77109	1.60812	1.47717	1.36880	1.27713	1.19828	1.12953
23	2.31596	2.02109	1.80812	1.64384	1.51165	1.40213	1.30939	1.22953
24	2.81596	2.35442	2.05812	1.84384	1.67832	1.54499	1.43439	1.34064

M \ N	25	26	27	28	29	30	31	32
25	3.81596	2.85442	2.39146	2.09384	1.87832	1.71165	1.57725	1.46564
26		3.85442	2.89146	2.42717	2.12832	1.91165	1.74391	1.60850
27			3.89146	2.92717	2.46165	2.16165	1.94391	1.77516
28				3.92717	2.96165	2.49499	2.19391	1.97516
29					3.96165	2.99499	2.52725	2.22516
30						3.99499	3.02725	2.55850
31							4.02725	3.05850
32								4.05850

EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

M \ N	33	34	35	36	37	38	39	40
1	0.03030	0.02941	0.02857	0.02778	0.02703	0.02632	0.02564	0.02500
2	0.06155	0.05971	0.05798	0.05635	0.05480	0.05334	0.05196	0.05064
3	0.09381	0.09096	0.08829	0.08576	0.08338	0.08112	0.07898	0.07696
4	0.12714	0.12322	0.11954	0.11606	0.11279	0.10969	0.10676	0.10398
5	0.16163	0.15656	0.15179	0.14731	0.14309	0.13910	0.13533	0.13176
6	0.19734	0.19104	0.18513	0.17957	0.17434	0.16941	0.16474	0.16033
7	0.23438	0.22675	0.21961	0.21291	0.20660	0.20066	0.19505	0.18974
8	0.27284	0.26379	0.25532	0.24739	0.23993	0.23291	0.22630	0.22005

M \ N	33	34	35	36	37	38	39	40
9	0.31284	0.30225	0.29236	0.28310	0.27442	0.26625	0.25856	0.25130
10	0.35451	0.34225	0.33082	0.32014	0.31013	0.30073	0.29189	0.28356
11	0.39798	0.38392	0.37082	0.35860	0.34717	0.33645	0.32637	0.31689
12	0.44344	0.42740	0.41249	0.39860	0.38563	0.37348	0.36209	0.35137
13	0.49106	0.47285	0.45597	0.44027	0.42563	0.41194	0.39912	0.38709
14	0.54106	0.52047	0.50142	0.48375	0.46729	0.45194	0.43758	0.42412
15	0.59369	0.57047	0.54904	0.52920	0.51077	0.49361	0.47758	0.46258
16	0.64925	0.62310	0.59904	0.57682	0.55623	0.53709	0.51925	0.50258

M \ N	33	34	35	36	37	38	39	40
17	0.70807	0.67866	0.65167	0.62682	0.60385	0.58254	0.56273	0.54425
18	0.77057	0.73748	0.70723	0.67945	0.65385	0.63016	0.60818	0.58773
19	0.83724	0.79998	0.76605	0.73501	0.70648	0.68016	0.65580	0.63318
20	0.90866	0.86665	0.82855	0.79383	0.76203	0.73279	0.70580	0.68080
21	0.98559	0.93808	0.89522	0.85633	0.82086	0.78835	0.75843	0.73080
22	1.06892	1.01500	0.96665	0.92300	0.88336	0.84717	0.81399	0.78343
23	1.15983	1.09833	1.04357	0.99443	0.95002	0.90967	0.87281	0.83899
24	1.25983	1.18924	1.12690	1.07135	1.02145	0.97634	0.93531	0.89781

M \ N	33	34	35	36	37	38	39	40
25	1.37094	1.28924	1.21781	1.15468	1.09838	1.04777	1.00198	0.96031
26	1.49594	1.40035	1.31781	1.24559	1.18171	1.12469	1.07341	1.02698
27	1.63880	1.52535	1.42892	1.34559	1.27262	1.20802	1.15033	1.09841
28	1.80546	1.66821	1.55392	1.45670	1.37262	1.29893	1.23367	1.17533
29	2.00546	1.83488	1.69678	1.58170	1.48373	1.39893	1.32457	1.25867
30	2.25546	2.03488	1.86345	1.72456	1.60873	1.51004	1.42457	1.34957
31	2.58880	2.28488	2.06345	1.89123	1.75159	1.63504	1.53569	1.44957
32	3.08880	2.61821	2.31345	2.09123	1.91825	1.77790	1.66069	1.56069

M \ N	33	34	35	36	37	38	39	40
33	4.08880	3.11821	2.64678	2.34123	2.11825	1.94457	1.80354	1.68569
34		4.11821	3.14678	2.67456	2.36825	2.14457	1.97021	1.82854
35			4.14678	3.17456	2.70159	2.39457	2.17021	1.99521
36				4.17456	3.20159	2.72790	2.42021	2.19521
37					4.20159	3.22790	2.75354	2.44521
38						4.22790	3.25354	2.77854
39							4.25354	3.27854
40								4.27854

M \ N	41	42	43	44	45	46	47	48
1	0.02439	0.02381	0.02326	0.02273	0.02222	0.02174	0.02128	0.02083
2	0.04939	0.04820	0.04707	0.04598	0.04495	0.04396	0.04302	0.04211
3	0.07503	0.07320	0.07146	0.06979	0.06821	0.06669	0.06524	0.06385
4	0.10135	0.09884	0.09646	0.09418	0.09201	0.08994	0.08797	0.08607
5	0.12837	0.12516	0.12210	0.11918	0.11641	0.11375	0.11122	0.10880
6	0.15615	0.15218	0.14841	0.14482	0.14141	0.13814	0.13503	0.13205
7	0.18472	0.17996	0.17544	0.17114	0.16705	0.16314	0.15942	0.15586
8	0.21414	0.20853	0.20322	0.19817	0.19336	0.18879	0.18442	0.18025

M \ N	41	42	43	44	45	46	47	48
9	0.24444	0.23794	0.23179	0.22594	0.22039	0.21510	0.21006	0.20525
10	0.27569	0.26825	0.26120	0.25452	0.24817	0.24213	0.23638	0.23090
11	0.30795	0.29950	0.29150	0.28393	0.27674	0.26991	0.26340	0.25721
12	0.34128	0.33176	0.32275	0.31423	0.30615	0.29848	0.29118	0.28424
13	0.37576	0.36509	0.35501	0.34548	0.33645	0.32789	0.31975	0.31202
14	0.41148	0.39957	0.38834	0.37774	0.36770	0.35819	0.34917	0.34059
15	0.44851	0.43529	0.42283	0.41107	0.39996	0.38944	0.37947	0.37000
16	0.48698	0.47232	0.45854	0.44555	0.43329	0.42170	0.41072	0.40030

M \ N	41	42	43	44	45	46	47	48
17	0.52698	0.51078	0.49558	0.48127	0.46778	0.45503	0.44298	0.43155
18	0.56864	0.55078	0.53404	0.51831	0.50349	0.48952	0.47631	0.46381
19	0.61212	0.59245	0.57404	0.55677	0.54053	0.52523	0.51079	0.49714
20	0.65757	0.63593	0.61571	0.59677	0.57899	0.56227	0.54651	0.53163
21	0.70519	0.68138	0.65919	0.63843	0.61899	0.60073	0.58354	0.56734
22	0.75519	0.72900	0.70464	0.68191	0.66066	0.64073	0.62201	0.60438
23	0.80783	0.77900	0.75226	0.72737	0.70413	0.68240	0.66201	0.64284
24	0.86338	0.83163	0.80226	0.77499	0.74959	0.72587	0.70367	0.68284

M \ N	41	42	43	44	45	46	47	48
25	0.92220	0.88719	0.85489	0.82499	0.79721	0.77133	0.74715	0.72451
26	0.98470	0.94601	0.91045	0.87762	0.84721	0.81895	0.79261	0.76798
27	1.05137	1.00851	0.96927	0.93317	0.89984	0.86895	0.84022	0.81344
28	1.12280	1.07518	1.03177	0.99200	0.95540	0.92158	0.89022	0.86106
29	1.19972	1.14661	1.09844	1.05450	1.01422	0.97713	0.94286	0.91106
30	1.28306	1.22353	1.16986	1.12116	1.07672	1.03596	0.99841	0.96369
31	1.37397	1.30687	1.24679	1.19259	1.14339	1.09846	1.05723	1.01924
32	1.47397	1.39777	1.33012	1.26952	1.21481	1.16512	1.11973	1.07807

M \ N	41	42	43	44	45	46	47	48
33	1.58508	1.49777	1.42103	1.35285	1.29174	1.23655	1.18640	1.14057
34	1.71008	1.60889	1.52103	1.44376	1.37507	1.31348	1.25783	1.20723
35	1.85293	1.73389	1.63214	1.54376	1.46598	1.39681	1.33475	1.27866
36	2.01960	1.87674	1.75714	1.65487	1.56598	1.48772	1.41809	1.35559
37	2.21960	2.04341	1.90000	1.77987	1.67709	1.58772	1.50900	1.43892
38	2.46960	2.24341	2.06667	1.92273	1.80209	1.69883	1.60900	1.52983
39	2.80293	2.49341	2.26667	2.08939	1.94495	1.82383	1.72011	1.62983
40	3.30293	2.82674	2.51667	2.28939	2.11161	1.96669	1.84511	1.74094

M \ N	41	42	43	44	45	46	47	48
41	4.30293	3.32674	2.85000	2.53939	2.31161	2.13335	1.98796	1.86594
42		4.32674	3.35000	2.87273	2.56161	2.33335	2.15463	2.00880
43			4.35000	3.37273	2.89495	2.58335	2.35463	2.17546
44				4.37273	3.39495	2.91669	2.60463	2.37546
45					4.39495	3.41669	2.93796	2.62546
46						4.41669	3.43796	2.95880
47							4.43796	3.45880
48								4.45880

M \ N	49	50	51	52	53	54	55	56
1	0.02041	0.02000	0.01961	0.01923	0.01887	0.01852	0.01818	0.01786
2	0.04124	0.04041	0.03961	0.03884	0.03810	0.03739	0.03670	0.03604
3	0.06252	0.06124	0.06002	0.05884	0.05771	0.05662	0.05557	0.05456
4	0.08426	0.08252	0.08085	0.07925	0.07771	0.07623	0.07480	0.07343
5	0.10648	0.10426	0.10213	0.10008	0.09811	0.09623	0.09441	0.09266
6	0.12921	0.12648	0.12387	0.12136	0.11895	0.11663	0.11441	0.11226
7	0.15246	0.14921	0.14609	0.14310	0.14022	0.13747	0.13482	0.13226
8	0.17627	0.17246	0.16881	0.16532	0.16196	0.15874	0.15565	0.15267

M \ N	49	50	51	52	53	54	55	56
9	0.20066	0.19627	0.19207	0.18805	0.18419	0.18048	0.17692	0.17351
10	0.22566	0.22066	0.21588	0.21130	0.20691	0.20270	0.19866	0.19478
11	0.25130	0.24566	0.24027	0.23511	0.23017	0.22543	0.22089	0.21652
12	0.27762	0.27130	0.26527	0.25950	0.25398	0.24869	0.24361	0.23874
13	0.30465	0.29762	0.29091	0.28450	0.27837	0.27250	0.26687	0.26147
14	0.33242	0.32465	0.31723	0.31014	0.30337	0.29689	0.29068	0.28473
15	0.36100	0.35242	0.34425	0.33646	0.32901	0.32189	0.31507	0.30854
16	0.39041	0.38100	0.37203	0.36348	0.35533	0.34753	0.34007	0.33293

M \ N	49	50	51	52	53	54	55	56
17	0.42071	0.41041	0.40060	0.39126	0.38235	0.37384	0.36571	0.35793
18	0.45196	0.44071	0.43001	0.41983	0.41013	0.40087	0.39203	0.38357
19	0.48422	0.47196	0.46032	0.44925	0.43870	0.42865	0.41905	0.40988
20	0.51755	0.50422	0.49157	0.47955	0.46811	0.45722	0.44683	0.43691
21	0.55203	0.53755	0.52383	0.51080	0.49842	0.48663	0.47540	0.46469
22	0.58775	0.57203	0.55716	0.54306	0.52967	0.51694	0.50481	0.49326
23	0.62479	0.60775	0.59164	0.57639	0.56192	0.54819	0.53512	0.52267
24	0.66325	0.64479	0.62736	0.61087	0.59526	0.58044	0.56637	0.55297

M \ N	49	50	51	52	53	54	55	56
25	0.70325	0.68325	0.66439	0.64659	0.62974	0.61378	0.59863	0.58422
26	0.74491	0.72325	0.70285	0.68362	0.66546	0.64826	0.63196	0.61648
27	0.78839	0.76491	0.74285	0.72209	0.70249	0.68397	0.66644	0.64982
28	0.83385	0.80839	0.78452	0.76209	0.74095	0.72101	0.70216	0.68430
29	0.88147	0.85385	0.82800	0.80375	0.78095	0.75947	0.73919	0.72001
30	0.93147	0.90147	0.87345	0.84723	0.82262	0.79947	0.77765	0.75705
31	0.98410	0.95147	0.92107	0.89269	0.86610	0.84114	0.81765	0.79551
32	1.03965	1.00410	0.97107	0.94030	0.91155	0.88462	0.85932	0.83551

M \ N	49	50	51	52	53	54	55	56
33	1.09848	1.05965	1.02371	0.99030	0.95917	0.93007	0.90280	0.87718
34	1.16098	1.11848	1.07926	1.04294	1.00917	0.97769	0.94825	0.92066
35	1.22764	1.18098	1.13808	1.09849	1.06180	1.02769	0.99587	0.96611
36	1.29907	1.24764	1.20058	1.15731	1.11736	1.08032	1.04587	1.01373
37	1.37599	1.31907	1.26725	1.21981	1.17618	1.13588	1.09850	1.06373
38	1.45933	1.39599	1.33868	1.28648	1.23868	1.19470	1.15406	1.11636
39	1.55024	1.47933	1.41560	1.35791	1.30535	1.25720	1.21288	1.17192
40	1.65024	1.57024	1.49894	1.43483	1.37678	1.32387	1.27538	1.23074

M \ N	49	50	51	52	53	54	55	56
41	1.76135	1.67024	1.58984	1.51817	1.45370	1.39530	1.34205	1.29324
42	1.88635	1.78135	1.68984	1.60908	1.53703	1.47222	1.41348	1.35991
43	2.02921	1.90635	1.80096	1.70908	1.62794	1.55555	1.49040	1.43134
44	2.19587	2.04921	1.92596	1.82019	1.72794	1.64646	1.57373	1.50826
45	2.39587	2.21587	2.06881	1.94519	1.83905	1.74646	1.66464	1.59159
46	2.64587	2.41587	2.23548	2.08804	1.96405	1.85757	1.76464	1.68250
47	2.97921	2.66587	2.43548	2.25471	2.10691	1.98257	1.87576	1.78250
48	3.47921	2.99921	2.68548	2.45471	2.27358	2.12543	2.00076	1.89361

M \ N	49	50	51	52	53	54	55	56
49	4.47921	3.49921	3.01881	2.70471	2.47358	2.29210	2.14361	2.01861
50		4.49921	3.51881	3.03804	2.72358	2.49210	2.31028	2.16147
51			4.51881	3.53804	3.05691	2.74210	2.51028	2.32814
52				4.53804	3.55691	3.07543	2.76028	2.52814
53					4.55691	3.57543	3.09361	2.77814
54						4.57543	3.59361	3.11147
55							4.59361	3.61147
56								4.61147

M \ N	57	58	59	60	61	62	63	64
1	0.01754	0.01724	0.01695	0.01667	0.01639	0.01613	0.01587	0.01563
2	0.03540	0.03479	0.03419	0.03362	0.03306	0.03252	0.03200	0.03150
3	0.05358	0.05264	0.05173	0.05086	0.05001	0.04919	0.04840	0.04763
4	0.07210	0.07082	0.06959	0.06840	0.06725	0.06614	0.06506	0.06402
5	0.09097	0.08934	0.08777	0.08626	0.08479	0.08338	0.08201	0.08069
6	0.11020	0.10821	0.10629	0.10444	0.10265	0.10092	0.09925	0.09764
7	0.12981	0.12744	0.12516	0.12296	0.12083	0.11878	0.11680	0.11488
8	0.14981	0.14705	0.14439	0.14183	0.13935	0.13696	0.13465	0.13242

M \ N	57	58	59	60	61	62	63	64
9	0.17022	0.16705	0.16400	0.16106	0.15822	0.15548	0.15284	0.15028
10	0.19105	0.18746	0.18400	0.18067	0.17745	0.17435	0.17135	0.16846
11	0.21233	0.20829	0.20441	0.20067	0.19706	0.19358	0.19022	0.18698
12	0.23407	0.22957	0.22524	0.22107	0.21706	0.21319	0.20945	0.20585
13	0.25629	0.25131	0.24652	0.24191	0.23747	0.23319	0.22906	0.22508
14	0.27901	0.27353	0.26826	0.26318	0.25830	0.25360	0.24906	0.24469
15	0.30227	0.29626	0.29048	0.28492	0.27958	0.27443	0.26947	0.26469
16	0.32608	0.31951	0.31321	0.30714	0.30132	0.29571	0.29030	0.28509

EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

M \ N	57	58	59	60	61	62	63	64
17	0.35047	0.34332	0.33646	0.32987	0.32354	0.31744	0.31158	0.30593
18	0.37547	0.36771	0.36027	0.35313	0.34627	0.33967	0.33332	0.32720
19	0.40111	0.39271	0.38466	0.37694	0.36952	0.36239	0.35554	0.34894
20	0.42743	0.41835	0.40966	0.40133	0.39333	0.38565	0.37827	0.37117
21	0.45445	0.44467	0.43530	0.42633	0.41772	0.40946	0.40152	0.39389
22	0.48223	0.47170	0.46162	0.45197	0.44272	0.43385	0.42533	0.41715
23	0.51080	0.49947	0.48864	0.47828	0.46836	0.45885	0.44972	0.44096
24	0.54021	0.52804	0.51642	0.50531	0.49468	0.48449	0.47472	0.46535

M \ N	57	58	59	60	61	62	63	64
25	0.57052	0.55746	0.54499	0.53309	0.52170	0.51081	0.50036	0.49035
26	0.60177	0.58776	0.57441	0.56166	0.54948	0.53783	0.52668	0.51599
27	0.63403	0.61901	0.60471	0.59107	0.57805	0.56561	0.55371	0.54230
28	0.66736	0.65127	0.63596	0.62138	0.60747	0.59418	0.58148	0.56933
29	0.70184	0.68460	0.66822	0.65263	0.63777	0.62359	0.61006	0.59711
30	0.73756	0.71908	0.70155	0.68488	0.66902	0.65390	0.63947	0.62568
31	0.77459	0.75480	0.73603	0.71822	0.70128	0.68515	0.66977	0.65509
32	0.81306	0.79183	0.77175	0.75270	0.73461	0.71741	0.70102	0.68540

M \ N	57	58	59	60	61	62	63	64
33	0.85306	0.83030	0.80878	0.78841	0.76909	0.75074	0.73328	0.71665
34	0.89472	0.87030	0.84725	0.82545	0.80481	0.78522	0.76661	0.74890
35	0.93820	0.91196	0.88725	0.86391	0.84184	0.82094	0.80109	0.78224
36	0.98365	0.95544	0.92891	0.90391	0.88031	0.85797	0.83681	0.81672
37	1.03127	1.00090	0.97239	0.94558	0.92031	0.89643	0.87385	0.85243
38	1.08127	1.04851	1.01785	0.98906	0.96197	0.93643	0.91231	0.88947
39	1.13391	1.09851	1.06546	1.03451	1.00545	0.97810	0.95231	0.92793
40	1.18946	1.15115	1.11546	1.08213	1.05091	1.02158	0.99397	0.96793

M \ N	57	58	59	60	61	62	63	64
41	1.24828	1.20670	1.16810	1.13213	1.09852	1.06703	1.03745	1.00960
42	1.31078	1.26553	1.22365	1.18476	1.14852	1.11465	1.08291	1.05308
43	1.37745	1.32803	1.28247	1.24032	1.20116	1.16465	1.13053	1.09853
44	1.44888	1.39469	1.34497	1.29914	1.25671	1.21728	1.18053	1.14615
45	1.52580	1.46612	1.41164	1.36164	1.31553	1.27284	1.23316	1.19615
46	1.60914	1.54304	1.48307	1.42831	1.37803	1.33166	1.28871	1.24878
47	1.70004	1.62638	1.55999	1.49974	1.44470	1.39416	1.34754	1.30434
48	1.80004	1.71729	1.64333	1.57666	1.51613	1.46083	1.41004	1.36316

M \ N	57	58	59	60	61	62	63	64
49	1.91116	1.81729	1.73424	1.65999	1.59305	1.53226	1.47670	1.42566
50	2.03616	1.92840	1.83424	1.75090	1.67639	1.60918	1.54813	1.49233
51	2.17901	2.05340	1.94535	1.85090	1.76730	1.69252	1.62506	1.56376
52	2.34568	2.19625	2.07035	1.96201	1.86730	1.78342	1.70839	1.64068
53	2.54568	2.36292	2.21320	2.08701	1.97841	1.88342	1.79930	1.72401
54	2.79568	2.56292	2.37987	2.22987	2.10341	1.99454	1.89930	1.81492
55	3.12901	2.81292	2.57987	2.39654	2.24626	2.11954	2.01041	1.91492
56	3.62901	3.14625	2.82987	2.59654	2.41293	2.26239	2.13541	2.02603

M \ N	57	58	59	60	61	62	63	64
57	4.62901	3.64625	3.16320	2.84654	2.61293	2.42906	2.27827	2.15103
58		4.64625	3.66320	3.17987	2.86293	2.62906	2.44493	2.29389
59			4.66320	3.67987	3.19626	2.87906	2.64493	2.46056
60				4.67987	3.69626	3.21239	2.89493	2.66056
61					4.69626	3.71239	3.22827	2.91056
62						4.71239	3.72827	3.24389
63							4.72827	3.74389
64								4.74389

M \ N	65	66	67	68	69	70	71	72
1	0.01538	0.01515	0.01493	0.01471	0.01449	0.01429	0.01408	0.01389
2	0.03101	0.03054	0.03008	0.02963	0.02920	0.02878	0.02837	0.02797
3	0.04688	0.04616	0.04546	0.04478	0.04412	0.04348	0.04286	0.04226
4	0.06301	0.06203	0.06109	0.06017	0.05928	0.05841	0.05757	0.05675
5	0.07941	0.07816	0.07696	0.07579	0.07466	0.07356	0.07249	0.07146
6	0.09607	0.09456	0.09309	0.09167	0.09029	0.08895	0.08765	0.08638
7	0.11302	0.11122	0.10948	0.10779	0.10616	0.10457	0.10303	0.10153
8	0.13026	0.12817	0.12615	0.12419	0.12229	0.12044	0.11866	0.11692

M \ N	65	66	67	68	69	70	71	72
9	0.14781	0.14541	0.14310	0.14085	0.13868	0.13657	0.13453	0.13254
10	0.16566	0.16296	0.16034	0.15780	0.15535	0.15297	0.15066	0.14842
11	0.18385	0.18081	0.17788	0.17505	0.17230	0.16963	0.16705	0.16455
12	0.20236	0.19900	0.19574	0.19259	0.18954	0.18658	0.18372	0.18094
13	0.22123	0.21752	0.21392	0.21045	0.20708	0.20382	0.20067	0.19761
14	0.24046	0.23638	0.23244	0.22863	0.22494	0.22137	0.21791	0.21456
15	0.26007	0.25561	0.25131	0.24715	0.24312	0.23922	0.23545	0.23180
16	0.28007	0.27522	0.27054	0.26601	0.26164	0.25741	0.25331	0.24934

M \ N	65	66	67	68	69	70	71	72
17	0.30048	0.29522	0.29015	0.28525	0.28051	0.27592	0.27149	0.26720
18	0.32131	0.31563	0.31015	0.30485	0.29974	0.29479	0.29001	0.28538
19	0.34259	0.33646	0.33056	0.32485	0.31935	0.31402	0.30888	0.30390
20	0.36433	0.35774	0.35139	0.34526	0.33935	0.33363	0.32811	0.32277
21	0.38655	0.37948	0.37267	0.36609	0.35975	0.35363	0.34772	0.34200
22	0.40928	0.40170	0.39440	0.38737	0.38059	0.37404	0.36772	0.36160
23	0.43253	0.42443	0.41663	0.40911	0.40186	0.39487	0.38812	0.38160
24	0.45634	0.44768	0.43935	0.43133	0.42360	0.41615	0.40896	0.40201

M \ N	65	66	67	68	69	70	71	72
25	0.48073	0.47149	0.46261	0.45406	0.44583	0.43789	0.43023	0.42285
26	0.50573	0.49588	0.48642	0.47732	0.46855	0.46011	0.45197	0.44412
27	0.53137	0.52088	0.51081	0.50113	0.49181	0.48284	0.47420	0.46586
28	0.55769	0.54653	0.53581	0.52552	0.51562	0.50609	0.49692	0.48808
29	0.58472	0.57284	0.56145	0.55052	0.54001	0.52990	0.52018	0.51081
30	0.61249	0.59987	0.58777	0.57616	0.56501	0.55429	0.54399	0.53407
31	0.64107	0.62765	0.61479	0.60247	0.59065	0.57929	0.56838	0.55788
32	0.67048	0.65622	0.64257	0.62950	0.61696	0.60493	0.59338	0.58227

EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

M \ N	65	66	67	68	69	70	71	72
33	0.70078	0.68563	0.67114	0.65728	0.64399	0.63125	0.61902	0.60727
34	0.73203	0.71593	0.70055	0.68585	0.67177	0.65828	0.64534	0.63291
35	0.76429	0.74718	0.73086	0.71526	0.70034	0.68606	0.67236	0.65922
36	0.79762	0.77944	0.76211	0.74556	0.72975	0.71463	0.70014	0.68625
37	0.83210	0.81277	0.79437	0.77681	0.76006	0.74404	0.72871	0.71403
38	0.86782	0.84726	0.82770	0.80907	0.79131	0.77434	0.75812	0.74260
39	0.90486	0.88297	0.86218	0.84240	0.82356	0.80559	0.78843	0.77201
40	0.94332	0.92001	0.89790	0.87689	0.85690	0.83785	0.81968	0.80231

M \ N	65	66	67	68	69	70	71	72
41	0.98332	0.95847	0.93493	0.91260	0.89138	0.87118	0.85193	0.83356
42	1.02498	0.99847	0.97339	0.94964	0.92709	0.90567	0.88527	0.86582
43	1.06846	1.04014	1.01339	0.98810	0.96413	0.94138	0.91975	0.89916
44	1.11392	1.08361	1.05506	1.02810	1.00259	0.97842	0.95546	0.93364
45	1.16154	1.12907	1.09854	1.06977	1.04259	1.01688	0.99250	0.96935
46	1.21154	1.17669	1.14399	1.11325	1.08426	1.05688	1.03096	1.00639
47	1.26417	1.22669	1.19161	1.15870	1.12774	1.09855	1.07096	1.04485
48	1.31972	1.27932	1.24161	1.20632	1.17319	1.14202	1.11263	1.08485

M \ N	65	66	67	68	69	70	71	72
49	1.37855	1.33487	1.29424	1.25632	1.22081	1.18748	1.15611	1.12652
50	1.44105	1.39370	1.34980	1.30895	1.27081	1.23510	1.20156	1.17000
51	1.50771	1.45620	1.40862	1.36451	1.32344	1.28510	1.24918	1.21545
52	1.57914	1.52286	1.47112	1.42333	1.37900	1.33773	1.29918	1.26307
53	1.65606	1.59429	1.53779	1.48583	1.43782	1.39328	1.35181	1.31307
54	1.73940	1.67122	1.60922	1.55250	1.50032	1.45211	1.40737	1.36570
55	1.83031	1.75455	1.68614	1.62392	1.56699	1.51461	1.46619	1.42126
56	1.93031	1.84546	1.76948	1.70085	1.63842	1.58127	1.52869	1.48008

M \ N	65	66	67	68	69	70	71	72
57	2.04142	1.94546	1.86038	1.78418	1.71534	1.65270	1.59536	1.54258
58	2.16642	2.05657	1.96038	1.87509	1.79867	1.72963	1.66679	1.60925
59	2.30928	2.18157	2.07150	1.97509	1.88958	1.81296	1.74371	1.68068
60	2.47594	2.32443	2.19650	2.08620	1.98958	1.90387	1.82704	1.75760
61	2.67594	2.49109	2.33935	2.21120	2.10069	2.00387	1.91795	1.84093
62	2.92594	2.69109	2.50602	2.35406	2.22569	2.11498	2.01795	1.93184
63	3.25928	2.94109	2.70602	2.52072	2.36855	2.23998	2.12906	2.03184
64	3.75928	3.27443	2.95602	2.72072	2.53522	2.38284	2.25406	2.14295

M \ N	65	66	67	68	69	70	71	72
65	4.75928	3.77443	3.28935	2.97072	2.73522	2.54950	2.39692	2.26795
66		4.77443	3.78935	3.30406	2.98522	2.74950	2.56359	2.41081
67			4.78935	3.80406	3.31855	2.99950	2.76359	2.57748
68				4.80406	3.81855	3.33284	3.01359	2.77748
69					4.81855	3.83284	3.34692	3.02748
70						4.83284	3.84692	3.36081
71							4.84692	3.86081
72								4.86081

M \ N	73	74	75	76	77	78	79	80
1	0.01370	0.01351	0.01333	0.01316	0.01299	0.01282	0.01266	0.01250
2	0.02759	0.02721	0.02685	0.02649	0.02614	0.02581	0.02548	0.02516
3	0.04167	0.04110	0.04055	0.04000	0.03948	0.03897	0.03847	0.03798
4	0.05596	0.05519	0.05443	0.05370	0.05299	0.05230	0.05162	0.05097
5	0.07045	0.06947	0.06852	0.06759	0.06669	0.06581	0.06496	0.06412
6	0.08516	0.08396	0.08280	0.08168	0.08058	0.07951	0.07847	0.07746
7	0.10008	0.09867	0.09730	0.09596	0.09466	0.09340	0.09217	0.09097
8	0.11523	0.11360	0.11200	0.11046	0.10895	0.10748	0.10606	0.10467

M \ N	73	74	75	76	77	78	79	80
9	0.13062	0.12875	0.12693	0.12516	0.12344	0.12177	0.12014	0.11856
10	0.14624	0.14413	0.14208	0.14009	0.13815	0.13626	0.13443	0.13264
11	0.16212	0.15976	0.15746	0.15524	0.15307	0.15097	0.14892	0.14693
12	0.17824	0.17563	0.17309	0.17062	0.16823	0.16589	0.16363	0.16142
13	0.19464	0.19176	0.18896	0.18625	0.18361	0.18105	0.17855	0.17613
14	0.21131	0.20815	0.20509	0.20212	0.19923	0.19643	0.19370	0.19105
15	0.22825	0.22482	0.22149	0.21825	0.21511	0.21206	0.20909	0.20620
16	0.24550	0.24177	0.23815	0.23464	0.23124	0.22793	0.22471	0.22159

M \ N	73	74	75	76	77	78	79	80
17	0.26304	0.25901	0.25510	0.25131	0.24763	0.24406	0.24059	0.23721
18	0.28090	0.27655	0.27234	0.26826	0.26430	0.26045	0.25672	0.25309
19	0.29908	0.29441	0.28989	0.28550	0.28125	0.27712	0.27311	0.26922
20	0.31760	0.31259	0.30774	0.30304	0.29849	0.29407	0.28978	0.28561
21	0.33646	0.33111	0.32593	0.32090	0.31603	0.31131	0.30672	0.30228
22	0.35570	0.34998	0.34444	0.33908	0.33389	0.32885	0.32397	0.31922
23	0.37530	0.36921	0.36331	0.35760	0.35207	0.34671	0.34151	0.33647
24	0.39530	0.38882	0.38254	0.37647	0.37059	0.36489	0.35937	0.35401

M \ N	73	74	75	76	77	78	79	80
25	0.41571	0.40882	0.40215	0.39570	0.38946	0.38341	0.37755	0.37187
26	0.43654	0.42923	0.42215	0.41531	0.40869	0.40228	0.39607	0.39005
27	0.45782	0.45006	0.44256	0.43531	0.42830	0.42151	0.41494	0.40857
28	0.47956	0.47134	0.46339	0.45572	0.44830	0.44112	0.43417	0.42744
29	0.50178	0.49307	0.48467	0.47655	0.46870	0.46112	0.45377	0.44667
30	0.52451	0.51530	0.50641	0.49783	0.48954	0.48152	0.47377	0.46627
31	0.54777	0.53802	0.52863	0.51957	0.51081	0.50236	0.49418	0.48627
32	0.57158	0.56128	0.55136	0.54179	0.53255	0.52363	0.51502	0.50668

M \ N	73	74	75	76	77	78	79	80
33	0.59597	0.58509	0.57461	0.56451	0.55477	0.54537	0.53629	0.52752
34	0.62097	0.60948	0.59842	0.58777	0.57750	0.56760	0.55803	0.54879
35	0.64661	0.63448	0.62281	0.61158	0.60076	0.59032	0.58025	0.57053
36	0.67292	0.66012	0.64781	0.63597	0.62457	0.61358	0.60298	0.59275
37	0.69995	0.68644	0.67345	0.66097	0.64896	0.63739	0.62624	0.61548
38	0.72773	0.71346	0.69977	0.68661	0.67396	0.66178	0.65005	0.63874
39	0.75630	0.74124	0.72680	0.71293	0.69960	0.68678	0.67444	0.66255
40	0.78571	0.76981	0.75457	0.73995	0.72591	0.71242	0.69944	0.68694

M \ N	73	74	75	76	77	78	79	80
41	0.81601	0.79922	0.78315	0.76773	0.75294	0.73873	0.72508	0.71194
42	0.84726	0.82953	0.81256	0.79630	0.78072	0.76576	0.75139	0.73758
43	0.87952	0.86078	0.84286	0.82572	0.80929	0.79354	0.77842	0.76389
44	0.91285	0.89304	0.87411	0.85602	0.83870	0.82211	0.80620	0.79092
45	0.94734	0.92637	0.90637	0.88727	0.86901	0.85152	0.83477	0.81870
46	0.98305	0.96085	0.93970	0.91953	0.90026	0.88183	0.86418	0.84727
47	1.02009	0.99657	0.97418	0.95286	0.93251	0.91308	0.89448	0.87668
48	1.05855	1.03360	1.00990	0.98734	0.96585	0.94533	0.92573	0.90698

M \ N	73	74	75	76	77	78	79	80
49	1.09855	1.07206	1.04694	1.02306	1.00033	0.97867	0.95799	0.93823
50	1.14022	1.11206	1.08540	1.06009	1.03604	1.01315	0.99133	0.97049
51	1.18370	1.15373	1.12540	1.09856	1.07308	1.04886	1.02581	1.00383
52	1.22915	1.19721	1.16706	1.13856	1.11154	1.08590	1.06152	1.03831
53	1.27677	1.24266	1.21054	1.18022	1.15154	1.12436	1.09856	1.07402
54	1.32677	1.29028	1.25600	1.22370	1.19321	1.16436	1.13702	1.11106
55	1.37940	1.34028	1.30362	1.26915	1.23669	1.20603	1.17702	1.14952
56	1.43496	1.39291	1.35362	1.31677	1.28214	1.24951	1.21869	1.18952

M \ N	73	74	75	76	77	78	79	80
57	1.49378	1.44847	1.40625	1.36677	1.32976	1.29496	1.26217	1.23119
58	1.55628	1.50729	1.46180	1.41941	1.37976	1.34258	1.30762	1.27467
59	1.62295	1.56979	1.52063	1.47496	1.43239	1.39258	1.35524	1.32012
60	1.69438	1.63646	1.58313	1.53378	1.48795	1.44521	1.40524	1.36774
61	1.77130	1.70789	1.64979	1.59628	1.54677	1.50077	1.45787	1.41774
62	1.85463	1.78481	1.72122	1.66295	1.60927	1.55959	1.51343	1.47037
63	1.94554	1.86814	1.79814	1.73438	1.67594	1.62209	1.57225	1.52593
64	2.04554	1.95905	1.88148	1.81130	1.74737	1.68876	1.63475	1.58475

M \ N	73	74	75	76	77	78	79	80
65	2.15665	2.05905	1.97239	1.89464	1.82429	1.76019	1.70142	1.64725
66	2.28165	2.17017	2.07239	1.98555	1.90762	1.83711	1.77285	1.71392
67	2.42451	2.29517	2.18350	2.08555	1.99853	1.92044	1.84977	1.78535
68	2.59118	2.43802	2.30850	2.19666	2.09853	2.01135	1.93310	1.86227
69	2.79118	2.60469	2.45136	2.32166	2.20964	2.11135	2.02401	1.94560
70	3.04118	2.80469	2.61802	2.46451	2.33464	2.22246	2.12401	2.03651
71	3.37451	3.05469	2.81802	2.63118	2.47750	2.34746	2.23512	2.13651
72	3.87451	3.38802	3.06802	2.83118	2.64417	2.49032	2.36012	2.24762

M \ N	73	74	75	76	77	78	79	80
73	4.87451	3.88802	3.40136	3.08118	2.84417	2.65699	2.50298	2.37262
74		4.88802	3.90136	3.41451	3.09417	2.85699	2.66965	2.51548
75			4.90136	3.91451	3.42750	3.10699	2.86965	2.68215
76				4.91451	3.92750	3.44032	3.11965	2.88215
77					4.92750	3.94032	3.45298	3.13215
78						4.94032	3.95298	3.46548
79							4.95298	3.96548
80								4.96548

M \ N	81	82	83	84	85	86	87	88
1	0.01235	0.01220	0.01205	0.01190	0.01176	0.01163	0.01149	0.01136
2	0.02485	0.02454	0.02424	0.02395	0.02367	0.02339	0.02312	0.02286
3	0.03750	0.03704	0.03659	0.03615	0.03572	0.03530	0.03489	0.03449
4	0.05032	0.04970	0.04909	0.04849	0.04791	0.04735	0.04679	0.04625
5	0.06331	0.06252	0.06175	0.06099	0.06026	0.05954	0.05884	0.05816
6	0.07647	0.07551	0.07457	0.07365	0.07276	0.07189	0.07103	0.07020
7	0.08980	0.08866	0.08755	0.08647	0.08542	0.08439	0.08338	0.08240
8	0.10332	0.10200	0.10071	0.09946	0.09824	0.09704	0.09588	0.09474

M \ N	81	82	83	84	85	86	87	88
9	0.11701	0.11551	0.11405	0.11262	0.11122	0.10987	0.10854	0.10724
10	0.13090	0.12921	0.12756	0.12595	0.12438	0.12285	0.12136	0.11990
11	0.14499	0.14310	0.14126	0.13946	0.13772	0.13601	0.13435	0.13272
12	0.15927	0.15718	0.15515	0.15316	0.15123	0.14934	0.14750	0.14571
13	0.17377	0.17147	0.16923	0.16705	0.16493	0.16286	0.16084	0.15887
14	0.18847	0.18596	0.18352	0.18114	0.17882	0.17656	0.17435	0.17220
15	0.20340	0.20067	0.19801	0.19542	0.19290	0.19044	0.18805	0.18571
16	0.21855	0.21559	0.21272	0.20991	0.20719	0.20453	0.20194	0.19941

M \ N	81	82	83	84	85	86	87	88
17	0.23393	0.23074	0.22764	0.22462	0.22168	0.21881	0.21602	0.21330
18	0.24956	0.24613	0.24279	0.23955	0.23639	0.23331	0.23031	0.22739
19	0.26543	0.26175	0.25818	0.25470	0.25131	0.24801	0.24480	0.24167
20	0.28156	0.27763	0.27380	0.27008	0.26646	0.26294	0.25951	0.25617
21	0.29795	0.29376	0.28968	0.28571	0.28185	0.27809	0.27443	0.27087
22	0.31462	0.31015	0.30580	0.30158	0.29747	0.29347	0.28958	0.28580
23	0.33157	0.32682	0.32220	0.31771	0.31334	0.30910	0.30497	0.30095
24	0.34881	0.34377	0.33886	0.33410	0.32947	0.32497	0.32059	0.31633

M \ N	81	82	83	84	85	86	87	88
25	0.36636	0.36101	0.35581	0.35077	0.34587	0.34110	0.33647	0.33196
26	0.38421	0.37855	0.37306	0.36772	0.36253	0.35750	0.35260	0.34783
27	0.40239	0.39641	0.39060	0.38496	0.37948	0.37416	0.36899	0.36396
28	0.42091	0.41459	0.40846	0.40250	0.39672	0.39111	0.38566	0.38035
29	0.43978	0.43311	0.42664	0.42036	0.41427	0.40835	0.40261	0.39702
30	0.45901	0.45198	0.44516	0.43854	0.43213	0.42590	0.41985	0.41397
31	0.47862	0.47121	0.46402	0.45706	0.45031	0.44375	0.43739	0.43121
32	0.49862	0.49081	0.48326	0.47593	0.46883	0.46194	0.45525	0.44875

M \ N	81	82	83	84	85	86	87	88
33	0.51903	0.51081	0.50286	0.49516	0.48769	0.48045	0.47343	0.46661
34	0.53986	0.53122	0.52286	0.51477	0.50692	0.49932	0.49195	0.48479
35	0.56114	0.55206	0.54327	0.53477	0.52653	0.51855	0.51082	0.50331
36	0.58288	0.57333	0.56410	0.55518	0.54653	0.53816	0.53005	0.52218
37	0.60510	0.59507	0.58538	0.57601	0.56694	0.55816	0.54965	0.54141
38	0.62783	0.61729	0.60712	0.59729	0.58777	0.57857	0.56965	0.56102
39	0.65108	0.64002	0.62934	0.61902	0.60905	0.59940	0.59006	0.58102
40	0.67489	0.66328	0.65207	0.64125	0.63079	0.62068	0.61090	0.60143

M \ N	81	82	83	84	85	86	87	88
41	0.69928	0.68709	0.67533	0.66397	0.65301	0.64242	0.63217	0.62226
42	0.72428	0.71148	0.69913	0.68723	0.67574	0.66464	0.65391	0.64354
43	0.74992	0.73648	0.72353	0.71104	0.69899	0.68737	0.67613	0.66528
44	0.77624	0.76212	0.74853	0.73543	0.72280	0.71062	0.69886	0.68750
45	0.80327	0.78843	0.77417	0.76043	0.74719	0.73443	0.72212	0.71022
46	0.83104	0.81546	0.80048	0.78607	0.77219	0.75882	0.74593	0.73348
47	0.85961	0.84324	0.82751	0.81239	0.79784	0.78382	0.77032	0.75729
48	0.88903	0.87181	0.85529	0.83941	0.82415	0.80946	0.79532	0.78168

M \ N	81	82	83	84	85	86	87	88
49	0.91933	0.90122	0.88386	0.86719	0.85118	0.83578	0.82096	0.80668
50	0.95058	0.93152	0.91327	0.89576	0.87896	0.86281	0.84727	0.83232
51	0.98284	0.96277	0.94357	0.92517	0.90753	0.89058	0.87430	0.85864
52	1.01617	0.99503	0.97482	0.95548	0.93694	0.91916	0.90208	0.88566
53	1.05065	1.02837	1.00708	0.98673	0.96724	0.94857	0.93065	0.91344
54	1.08637	1.06285	1.04041	1.01899	0.99849	0.97887	0.96006	0.94201
55	1.12341	1.09856	1.07490	1.05232	1.03075	1.01012	0.99036	0.97143
56	1.16187	1.13560	1.11061	1.08680	1.06408	1.04238	1.02161	1.00173

M \ N	81	82	83	84	85	86	87	88
57	1.20187	1.17406	1.14765	1.12252	1.09857	1.07571	1.05387	1.03298
58	1.24353	1.21406	1.18611	1.15955	1.13428	1.11019	1.08721	1.06524
59	1.28701	1.25573	1.22611	1.19801	1.17132	1.14591	1.12169	1.09857
60	1.33247	1.29921	1.26778	1.23801	1.20978	1.18295	1.15740	1.13305
61	1.38009	1.34466	1.31126	1.27968	1.24978	1.22141	1.19444	1.16877
62	1.43009	1.39228	1.35671	1.32316	1.29145	1.26141	1.23290	1.20580
63	1.48272	1.44228	1.40433	1.36861	1.33492	1.30307	1.27290	1.24427
64	1.53827	1.49491	1.45433	1.41623	1.38038	1.34655	1.31457	1.28427

M \ N	81	82	83	84	85	86	87	88
65	1.59710	1.55047	1.50696	1.46623	1.42800	1.39201	1.35805	1.32593
66	1.65960	1.60929	1.56252	1.51886	1.47800	1.43963	1.40350	1.36941
67	1.72626	1.67179	1.62134	1.57442	1.53063	1.48963	1.45112	1.41486
68	1.79769	1.73846	1.68384	1.63324	1.58619	1.54226	1.50112	1.46248
69	1.87461	1.80989	1.75051	1.69574	1.64501	1.59781	1.55375	1.51248
70	1.95795	1.88681	1.82193	1.76241	1.70751	1.65664	1.60931	1.56512
71	2.04886	1.97014	1.89886	1.83384	1.77418	1.71914	1.66813	1.62067
72	2.14886	2.06105	1.98219	1.91076	1.84560	1.78580	1.73063	1.67949

M \ N	81	82	83	84	85	86	87	88
73	2.25997	2.16105	2.07310	1.99410	1.92253	1.85723	1.79730	1.74199
74	2.38497	2.27216	2.17310	2.08500	2.00586	1.93415	1.86873	1.80866
75	2.52782	2.39716	2.28421	2.18500	2.09677	2.01749	1.94565	1.88009
76	2.69449	2.54002	2.40921	2.29612	2.19677	2.10840	2.02898	1.95701
77	2.89449	2.70669	2.55207	2.42112	2.30788	2.20840	2.11989	2.04035
78	3.14449	2.90669	2.71873	2.56397	2.43288	2.31951	2.21989	2.13126
79	3.47782	3.15669	2.91873	2.73064	2.57574	2.44451	2.33100	2.23126
80	3.97782	3.49002	3.16873	2.93064	2.74240	2.58737	2.45600	2.34237

M \ N	81	82	83	84	85	86	87	88
81	4.97782	3.99002	3.50207	3.18064	2.94240	2.75403	2.59886	2.46737
82		4.99002	4.00207	3.51397	3.19240	2.95403	2.76553	2.61022
83			5.00207	4.01397	3.52574	3.20403	2.96553	2.77689
84				5.01397	4.02574	3.53737	3.21553	2.97689
85					5.02574	4.03737	3.54886	3.22689
86						5.03737	4.04886	3.56022
87							5.04886	4.06022
88								5.06022

M \ N	89	90	91	92	93	94	95	96
1	0.01124	0.01111	0.01099	0.01087	0.01075	0.01064	0.01053	0.01042
2	0.02260	0.02235	0.02210	0.02186	0.02162	0.02139	0.02116	0.02094
3	0.03409	0.03371	0.03334	0.03297	0.03261	0.03226	0.03192	0.03158
4	0.04572	0.04520	0.04470	0.04421	0.04372	0.04325	0.04279	0.04233
5	0.05749	0.05683	0.05619	0.05557	0.05496	0.05436	0.05378	0.05320
6	0.06939	0.06860	0.06782	0.06706	0.06632	0.06560	0.06489	0.06419
7	0.08144	0.08050	0.07959	0.07869	0.07782	0.07696	0.07612	0.07530
8	0.09363	0.09255	0.09149	0.09046	0.08944	0.08845	0.08749	0.08654

M \ N	89	90	91	92	93	94	95	96
9	0.10598	0.10475	0.10354	0.10236	0.10121	0.10008	0.09898	0.09790
10	0.11848	0.11709	0.11573	0.11441	0.11311	0.11185	0.11061	0.10940
11	0.13114	0.12959	0.12808	0.12660	0.12516	0.12375	0.12237	0.12103
12	0.14396	0.14225	0.14058	0.13895	0.13736	0.13580	0.13428	0.13279
13	0.15695	0.15507	0.15324	0.15145	0.14970	0.14800	0.14633	0.14469
14	0.17010	0.16806	0.16606	0.16411	0.16220	0.16034	0.15852	0.15674
15	0.18344	0.18121	0.17905	0.17693	0.17486	0.17284	0.17087	0.16894
16	0.19695	0.19455	0.19220	0.18992	0.18768	0.18550	0.18337	0.18128

M \ N	89	90	91	92	93	94	95	96
17	0.21065	0.20806	0.20554	0.20307	0.20067	0.19832	0.19603	0.19378
18	0.22454	0.22176	0.21905	0.21641	0.21383	0.21131	0.20885	0.20644
19	0.23862	0.23565	0.23275	0.22992	0.22716	0.22446	0.22183	0.21926
20	0.25291	0.24973	0.24664	0.24362	0.24067	0.23780	0.23499	0.23225
21	0.26740	0.26402	0.26072	0.25751	0.25437	0.25131	0.24832	0.24541
22	0.28211	0.27851	0.27501	0.27159	0.26826	0.26501	0.26184	0.25874
23	0.29703	0.29322	0.28950	0.28588	0.28235	0.27890	0.27554	0.27225
24	0.31218	0.30814	0.30421	0.30037	0.29663	0.29298	0.28943	0.28595

M \ N	89	90	91	92	93	94	95	96
25	0.32757	0.32330	0.31913	0.31508	0.31112	0.30727	0.30351	0.29984
26	0.34319	0.33868	0.33428	0.33000	0.32583	0.32176	0.31780	0.31393
27	0.35907	0.35430	0.34967	0.34515	0.34075	0.33647	0.33229	0.32821
28	0.37520	0.37018	0.36529	0.36054	0.35591	0.35139	0.34699	0.34270
29	0.39159	0.38631	0.38117	0.37616	0.37129	0.36654	0.36192	0.35741
30	0.40826	0.40270	0.39730	0.39204	0.38692	0.38193	0.37707	0.37234
31	0.42520	0.41937	0.41369	0.40817	0.40279	0.39755	0.39246	0.38749
32	0.44245	0.43632	0.43036	0.42456	0.41892	0.41343	0.40808	0.40287

M \ N	89	90	91	92	93	94	95	96
33	0.45999	0.45356	0.44731	0.44123	0.43531	0.42956	0.42395	0.41850
34	0.47785	0.47110	0.46455	0.45817	0.45198	0.44595	0.44008	0.43437
35	0.49603	0.48896	0.48209	0.47542	0.46893	0.46262	0.45648	0.45050
36	0.51455	0.50714	0.49995	0.49296	0.48617	0.47957	0.47314	0.46689
37	0.53342	0.52566	0.51813	0.51082	0.50371	0.49681	0.49009	0.48356
38	0.55265	0.54453	0.53665	0.52900	0.52157	0.51435	0.50733	0.50051
39	0.57225	0.56376	0.55552	0.54752	0.53975	0.53221	0.52488	0.51775
40	0.59225	0.58337	0.57475	0.56639	0.55827	0.55039	0.54273	0.53529

M \ N	89	90	91	92	93	94	95	96
41	0.61266	0.60337	0.59435	0.58562	0.57714	0.56891	0.56092	0.55315
42	0.63350	0.62377	0.61435	0.60522	0.59637	0.58778	0.57943	0.57133
43	0.65477	0.64461	0.63476	0.62522	0.61598	0.60701	0.59830	0.58985
44	0.67651	0.66588	0.65560	0.64563	0.63598	0.62661	0.61753	0.60872
45	0.69873	0.68762	0.67687	0.66647	0.65638	0.64661	0.63714	0.62795
46	0.72146	0.70984	0.69861	0.68774	0.67722	0.66702	0.65714	0.64756
47	0.74472	0.73257	0.72083	0.70948	0.69849	0.68786	0.67755	0.66756
48	0.76853	0.75583	0.74356	0.73170	0.72023	0.70913	0.69838	0.68797

M \ N	89	90	91	92	93	94	95	96
49	0.79292	0.77964	0.76682	0.75443	0.74246	0.73087	0.71966	0.70880
50	0.81792	0.80403	0.79063	0.77769	0.76518	0.75309	0.74140	0.73008
51	0.84356	0.82903	0.81502	0.80150	0.78844	0.77582	0.76362	0.75182
52	0.86987	0.85467	0.84002	0.82589	0.81225	0.79908	0.78635	0.77404
53	0.89690	0.88098	0.86566	0.85089	0.83664	0.82289	0.80960	0.79676
54	0.92468	0.90801	0.89197	0.87653	0.86164	0.84728	0.83341	0.82002
55	0.95325	0.93579	0.91900	0.90284	0.88728	0.87228	0.85780	0.84383
56	0.98266	0.96436	0.94678	0.92987	0.91360	0.89792	0.88280	0.86822

M \ N	89	90	91	92	93	94	95	96
57	1.01296	0.99377	0.97535	0.95765	0.94062	0.92423	0.90844	0.89322
58	1.04421	1.02408	1.00476	0.98622	0.96840	0.95126	0.93476	0.91886
59	1.07647	1.05533	1.03506	1.01563	0.99697	0.97904	0.96179	0.94518
60	1.10981	1.08758	1.06631	1.04593	1.02638	1.00761	0.98957	0.97220
61	1.14429	1.12092	1.09857	1.07718	1.05669	1.03702	1.01814	0.99998
62	1.18000	1.15540	1.13191	1.10944	1.08794	1.06732	1.04755	1.02855
63	1.21704	1.19111	1.16639	1.14278	1.12019	1.09857	1.07785	1.05796
64	1.25550	1.22815	1.20210	1.17726	1.15353	1.13083	1.10910	1.08827

M \ N	89	90	91	92	93	94	95	96
65	1.29550	1.26661	1.23914	1.21297	1.18801	1.16417	1.14136	1.11952
66	1.33717	1.30661	1.27760	1.25001	1.22373	1.19865	1.17469	1.15178
67	1.38065	1.34828	1.31760	1.28847	1.26076	1.23436	1.20918	1.18511
68	1.42610	1.39176	1.35927	1.32847	1.29922	1.27140	1.24489	1.21959
69	1.47372	1.43721	1.40275	1.37014	1.33922	1.30986	1.28193	1.25531
70	1.52372	1.48483	1.44820	1.41362	1.38089	1.34986	1.32039	1.29234
71	1.57635	1.53483	1.49582	1.45907	1.42437	1.39153	1.36039	1.33080
72	1.63191	1.58746	1.54582	1.50669	1.46982	1.43501	1.40205	1.37080

M \ N	89	90	91	92	93	94	95	96
73	1.69073	1.64302	1.59845	1.55669	1.51744	1.48046	1.44553	1.41247
74	1.75323	1.70184	1.65401	1.60932	1.56744	1.52808	1.49099	1.45595
75	1.81990	1.76434	1.71283	1.66488	1.62007	1.57808	1.53861	1.50140
76	1.89133	1.83101	1.77533	1.72370	1.67563	1.63071	1.58861	1.54902
77	1.96825	1.90244	1.84200	1.78620	1.73445	1.68627	1.64124	1.59902
78	2.05158	1.97936	1.91343	1.85287	1.79695	1.74509	1.69679	1.65166
79	2.14249	2.06269	1.99035	1.92430	1.86362	1.80759	1.75562	1.70721
80	2.24249	2.15360	2.07368	2.00122	1.93505	1.87426	1.81812	1.76603

M \ N	89	90	91	92	93	94	95	96
81	2.35360	2.25360	2.16459	2.08455	2.01197	1.94569	1.88478	1.82853
82	2.47860	2.36471	2.26459	2.17546	2.09530	2.02261	1.95621	1.89520
83	2.62146	2.48971	2.37570	2.27546	2.18621	2.10594	2.03314	1.96663
84	2.78813	2.63257	2.50070	2.38657	2.28621	2.19685	2.11647	2.04355
85	2.98813	2.79924	2.64356	2.51157	2.39732	2.29685	2.20738	2.12689
86	3.23813	2.99924	2.81023	2.65443	2.52232	2.40796	2.30738	2.21779
87	3.57146	3.24924	3.01023	2.82110	2.66518	2.53296	2.41849	2.31779
88	4.07146	3.58257	3.26023	3.02110	2.83185	2.67582	2.54349	2.42891

M \ N	89	90	91	92	93	94	95	96
89	5.07146	4.08257	3.59356	3.27110	3.03185	2.84249	2.68635	2.55391
90		5.08257	4.09356	3.60443	3.28185	3.04249	2.85301	2.69676
91			5.09356	4.10443	3.61518	3.29249	3.05301	2.86343
92				5.10443	4.11518	3.62582	3.30301	3.06343
93					5.11518	4.12582	3.63635	3.31343
94						5.12582	4.13635	3.64676
95							5.13635	4.14676
96								5.14676

M \ N	97	98	99	100	101	102	103	104
1	0.01031	0.01020	0.01010	0.01000	0.00990	0.00980	0.00971	0.00962
2	0.02073	0.02051	0.02031	0.02010	0.01990	0.01970	0.01951	0.01932
3	0.03125	0.03093	0.03061	0.03031	0.03000	0.02970	0.02941	0.02913
4	0.04189	0.04146	0.04103	0.04061	0.04021	0.03981	0.03941	0.03903
5	0.05264	0.05209	0.05156	0.05103	0.05052	0.05001	0.04951	0.04903
6	0.06351	0.06285	0.06220	0.06156	0.06093	0.06032	0.05972	0.05913
7	0.07450	0.07372	0.07295	0.07220	0.07146	0.07074	0.07003	0.06933
8	0.08561	0.08471	0.08382	0.08295	0.08210	0.08126	0.08044	0.07964

M \ N	97	98	99	100	101	102	103	104
9	0.09685	0.09582	0.09481	0.09382	0.09285	0.09190	0.09097	0.09006
10	0.10821	0.10705	0.10592	0.10481	0.10372	0.10265	0.10161	0.10059
11	0.11971	0.11842	0.11715	0.11592	0.11471	0.11352	0.11236	0.11122
12	0.13133	0.12991	0.12852	0.12715	0.12582	0.12451	0.12323	0.12198
13	0.14310	0.14154	0.14001	0.13852	0.13705	0.13562	0.13422	0.13285
14	0.15500	0.15330	0.15164	0.15001	0.14842	0.14686	0.14533	0.14384
15	0.16705	0.16521	0.16340	0.16164	0.15991	0.15822	0.15657	0.15495
16	0.17925	0.17726	0.17531	0.17340	0.17154	0.16972	0.16793	0.16618

M \ N	97	98	99	100	101	102	103	104
17	0.19159	0.18945	0.18736	0.18531	0.18331	0.18134	0.17943	0.17755
18	0.20409	0.20180	0.19955	0.19736	0.19521	0.19311	0.19105	0.18904
19	0.21675	0.21430	0.21190	0.20955	0.20726	0.20501	0.20282	0.20067
20	0.22957	0.22696	0.22440	0.22190	0.21945	0.21706	0.21472	0.21243
21	0.24256	0.23978	0.23706	0.23440	0.23180	0.22926	0.22677	0.22434
22	0.25572	0.25276	0.24988	0.24706	0.24430	0.24160	0.23897	0.23639
23	0.26905	0.26592	0.26286	0.25988	0.25696	0.25410	0.25131	0.24858
24	0.28256	0.27925	0.27602	0.27286	0.26978	0.26676	0.26381	0.26093

M \ N	97	98	99	100	101	102	103	104
25	0.29626	0.29277	0.28936	0.28602	0.28276	0.27958	0.27647	0.27343
26	0.31015	0.30647	0.30287	0.29936	0.29592	0.29257	0.28929	0.28609
27	0.32424	0.32036	0.31657	0.31287	0.30926	0.30573	0.30228	0.29891
28	0.33852	0.33444	0.33046	0.32657	0.32277	0.31906	0.31544	0.31189
29	0.35301	0.34873	0.34454	0.34046	0.33647	0.33257	0.32877	0.32505
30	0.36772	0.36322	0.35883	0.35454	0.35036	0.34627	0.34228	0.33838
31	0.38265	0.37792	0.37332	0.36883	0.36444	0.36016	0.35598	0.35190
32	0.39780	0.39285	0.38803	0.38332	0.37873	0.37425	0.36987	0.36560

M \ N	97	98	99	100	101	102	103	104
33	0.41318	0.40800	0.40295	0.39803	0.39322	0.38853	0.38395	0.37949
34	0.42881	0.42339	0.41810	0.41295	0.40793	0.40302	0.39824	0.39357
35	0.44468	0.43901	0.43349	0.42810	0.42285	0.41773	0.41273	0.40786
36	0.46081	0.45488	0.44911	0.44349	0.43800	0.43266	0.42744	0.42235
37	0.47720	0.47101	0.46498	0.45911	0.45339	0.44781	0.44236	0.43705
38	0.49387	0.48741	0.48111	0.47498	0.46901	0.46319	0.45752	0.45198
39	0.51082	0.50407	0.49751	0.49111	0.48489	0.47882	0.47290	0.46713
40	0.52806	0.52102	0.51417	0.50751	0.50101	0.49469	0.48853	0.48252

M \ N	97	98	99	100	101	102	103	104
41	0.54560	0.53826	0.53112	0.52417	0.51741	0.51082	0.50440	0.49814
42	0.56346	0.55581	0.54836	0.54112	0.53407	0.52721	0.52053	0.51401
43	0.58164	0.57366	0.56591	0.55836	0.55102	0.54388	0.53692	0.53014
44	0.60016	0.59185	0.58377	0.57591	0.56827	0.56083	0.55359	0.54654
45	0.61903	0.61036	0.60195	0.59377	0.58581	0.57807	0.57054	0.56320
46	0.63826	0.62923	0.62047	0.61195	0.60367	0.59561	0.58778	0.58015
47	0.65787	0.64846	0.63933	0.63047	0.62185	0.61347	0.60532	0.59739
48	0.67787	0.66807	0.65856	0.64933	0.64037	0.63165	0.62318	0.61494

M \ N	97	98	99	100	101	102	103	104
49	0.69828	0.68807	0.67817	0.66856	0.65923	0.65017	0.64136	0.63279
50	0.71911	0.70848	0.69817	0.68817	0.67847	0.66904	0.65988	0.65098
51	0.74039	0.72931	0.71858	0.70817	0.69807	0.68827	0.67875	0.66949
52	0.76212	0.75059	0.73941	0.72858	0.71807	0.70788	0.69798	0.68836
53	0.78435	0.77233	0.76069	0.74941	0.73848	0.72788	0.71759	0.70759
54	0.80707	0.79455	0.78243	0.77069	0.75931	0.74829	0.73759	0.72720
55	0.83033	0.81728	0.80465	0.79243	0.78059	0.76912	0.75799	0.74720
56	0.85414	0.84053	0.82738	0.81465	0.80233	0.79040	0.77883	0.76761

M \ N	97	98	99	100	101	102	103	104
57	0.87853	0.86434	0.85063	0.83738	0.82455	0.81213	0.80010	0.78844
58	0.90353	0.88873	0.87444	0.86063	0.84728	0.83436	0.82184	0.80972
59	0.92917	0.91373	0.89883	0.88444	0.87054	0.85708	0.84407	0.83146
60	0.95549	0.93937	0.92383	0.90883	0.89435	0.88034	0.86679	0.85368
61	0.98251	0.96569	0.94948	0.93383	0.91874	0.90415	0.89005	0.87641
62	1.01029	0.99272	0.97579	0.95948	0.94374	0.92854	0.91386	0.89966
63	1.03886	1.02050	1.00282	0.98579	0.96938	0.95354	0.93825	0.92347
64	1.06827	1.04907	1.03060	1.01282	0.99569	0.97918	0.96325	0.94786

M \ N	97	98	99	100	101	102	103	104
65	1.09858	1.07848	1.05917	1.04060	1.02272	1.00550	0.98889	0.97286
66	1.12983	1.10878	1.08858	1.06917	1.05050	1.03252	1.01520	0.99850
67	1.16209	1.14003	1.11888	1.09858	1.07907	1.06030	1.04223	1.02482
68	1.19542	1.17229	1.15013	1.12888	1.10848	1.08887	1.07001	1.05185
69	1.22990	1.20562	1.18239	1.16013	1.13878	1.11828	1.09858	1.07963
70	1.26562	1.24011	1.21572	1.19239	1.17003	1.14859	1.12799	1.10820
71	1.30265	1.27582	1.25021	1.22572	1.20229	1.17984	1.15830	1.13761
72	1.34111	1.31286	1.28592	1.26021	1.23562	1.21210	1.18955	1.16791

M \ N	97	98	99	100	101	102	103	104
73	1.38111	1.35132	1.32296	1.29592	1.27011	1.24543	1.22180	1.19916
74	1.42278	1.39132	1.36142	1.33296	1.30582	1.27991	1.25514	1.23142
75	1.46626	1.43298	1.40142	1.37142	1.34286	1.31563	1.28962	1.26475
76	1.51171	1.47646	1.44309	1.41142	1.38132	1.35266	1.32533	1.29924
77	1.55933	1.52192	1.48656	1.45309	1.42132	1.39112	1.36237	1.33495
78	1.60933	1.56954	1.53202	1.49656	1.46299	1.43112	1.40083	1.37199
79	1.66196	1.61954	1.57964	1.54202	1.50647	1.47279	1.44083	1.41045
80	1.71752	1.67217	1.62964	1.58964	1.55192	1.51627	1.48250	1.45045

M \ N	97	98	99	100	101	102	103	104
81	1.77634	1.72772	1.68227	1.63964	1.59954	1.56172	1.52598	1.49212
82	1.83884	1.78655	1.73782	1.69227	1.64954	1.60934	1.57143	1.53559
83	1.90551	1.84905	1.79665	1.74782	1.70217	1.65934	1.61905	1.58105
84	1.97694	1.91571	1.85915	1.80665	1.75773	1.71197	1.66905	1.62867
85	2.05386	1.98714	1.92582	1.86915	1.81655	1.76753	1.72168	1.67867
86	2.13720	2.06407	1.99724	1.93582	1.87905	1.82635	1.77724	1.73130
87	2.22810	2.14740	2.07417	2.00724	1.94572	1.88885	1.83606	1.78685
88	2.32810	2.23831	2.15750	2.08417	2.01714	1.95552	1.89856	1.84568

M \ N	97	98	99	100	101	102	103	104
89	2.43922	2.33831	2.24841	2.16750	2.09407	2.02695	1.96523	1.90818
90	2.56422	2.44942	2.34841	2.25841	2.17740	2.10387	2.03666	1.97484
91	2.70707	2.57442	2.45952	2.35841	2.26831	2.18721	2.11358	2.04627
92	2.87374	2.71728	2.58452	2.46952	2.36831	2.27811	2.19691	2.12320
93	3.07374	2.88394	2.72738	2.59452	2.47942	2.37811	2.28782	2.20653
94	3.32374	3.08394	2.89404	2.73738	2.60442	2.48923	2.38782	2.29744
95	3.65707	3.33394	3.09404	2.90404	2.74728	2.61423	2.49893	2.39744
96	4.15707	3.66728	3.34404	3.10404	2.91395	2.75708	2.62393	2.50855

M \ N	97	98	99	100	101	102	103	104
97	5.15707	4.16728	3.67738	3.35404	3.11395	2.92375	2.76679	2.63355
98		5.16728	4.17738	3.68738	3.36395	3.12375	2.93346	2.77641
99			5.17738	4.18738	3.69728	3.37375	3.13346	2.94307
100				5.18738	4.19728	3.70708	3.38346	3.14307
101					5.19728	4.20708	3.71679	3.39307
102						5.20708	4.21679	3.72641
103							5.21679	4.22641
104								5.22641

M \ N	105	106	107	108	109	110	111	112
1	0.00952	0.00943	0.00935	0.00926	0.00917	0.00909	0.00901	0.00893
2	0.01914	0.01896	0.01878	0.01861	0.01843	0.01827	0.01810	0.01794
3	0.02885	0.02857	0.02830	0.02804	0.02778	0.02752	0.02727	0.02703
4	0.03865	0.03828	0.03792	0.03756	0.03721	0.03687	0.03653	0.03620
5	0.04855	0.04809	0.04763	0.04718	0.04674	0.04630	0.04588	0.04546
6	0.05855	0.05799	0.05743	0.05689	0.05635	0.05583	0.05531	0.05481
7	0.06865	0.06799	0.06733	0.06669	0.06606	0.06544	0.06484	0.06424
8	0.07886	0.07809	0.07733	0.07659	0.07587	0.07515	0.07445	0.07377

M \ N	105	106	107	108	109	110	111	112
9	0.08917	0.08829	0.08743	0.08659	0.08577	0.08496	0.08416	0.08338
10	0.09958	0.09860	0.09764	0.09669	0.09577	0.09486	0.09397	0.09309
11	0.11011	0.10902	0.10795	0.10690	0.10587	0.10486	0.10387	0.10289
12	0.12075	0.11954	0.11836	0.11721	0.11607	0.11496	0.11387	0.11279
13	0.13150	0.13018	0.12889	0.12762	0.12638	0.12516	0.12397	0.12279
14	0.14237	0.14094	0.13953	0.13815	0.13680	0.13547	0.13417	0.13290
15	0.15336	0.15180	0.15028	0.14879	0.14732	0.14589	0.14448	0.14310
16	0.16447	0.16279	0.16115	0.15954	0.15796	0.15641	0.15490	0.15341

M \ N	105	106	107	108	109	110	111	112
17	0.17571	0.17390	0.17214	0.17041	0.16871	0.16705	0.16542	0.16383
18	0.18707	0.18514	0.18325	0.18140	0.17958	0.17781	0.17606	0.17435
19	0.19856	0.19650	0.19449	0.19251	0.19057	0.18867	0.18681	0.18499
20	0.21019	0.20800	0.20585	0.20375	0.20168	0.19966	0.19768	0.19574
21	0.22196	0.21963	0.21734	0.21511	0.21292	0.21078	0.20867	0.20661
22	0.23386	0.23139	0.22897	0.22660	0.22428	0.22201	0.21978	0.21760
23	0.24591	0.24330	0.24074	0.23823	0.23578	0.23337	0.23102	0.22871
24	0.25811	0.25534	0.25264	0.25000	0.24741	0.24487	0.24238	0.23995

M \ N	105	106	107	108	109	110	111	112
25	0.27045	0.26754	0.26469	0.26190	0.25917	0.25650	0.25388	0.25131
26	0.28295	0.27989	0.27689	0.27395	0.27108	0.26826	0.26551	0.26281
27	0.29561	0.29239	0.28923	0.28614	0.28312	0.28017	0.27727	0.27443
28	0.30843	0.30504	0.30173	0.29849	0.29532	0.29221	0.28918	0.28620
29	0.32142	0.31786	0.31439	0.31099	0.30766	0.30441	0.30122	0.29810
30	0.33457	0.33085	0.32721	0.32365	0.32016	0.31676	0.31342	0.31015
31	0.34791	0.34401	0.34020	0.33647	0.33282	0.32926	0.32576	0.32235
32	0.36142	0.35734	0.35335	0.34946	0.34564	0.34191	0.33826	0.33469

M \ N	105	106	107	108	109	110	111	112
33	0.37512	0.37086	0.36669	0.36261	0.35863	0.35473	0.35092	0.34719
34	0.38901	0.38455	0.38020	0.37595	0.37179	0.36772	0.36374	0.35985
35	0.40309	0.39844	0.39390	0.38946	0.38512	0.38088	0.37673	0.37267
36	0.41738	0.41253	0.40779	0.40316	0.39863	0.39421	0.38989	0.38566
37	0.43187	0.42681	0.42187	0.41705	0.41233	0.40773	0.40322	0.39882
38	0.44658	0.44131	0.43616	0.43113	0.42622	0.42142	0.41673	0.41215
39	0.46150	0.45601	0.45065	0.44542	0.44031	0.43531	0.43043	0.42566
40	0.47665	0.47094	0.46536	0.45991	0.45459	0.44940	0.44432	0.43936

M \ N	105	106	107	108	109	110	111	112
41	0.49204	0.48609	0.48028	0.47462	0.46909	0.46368	0.45841	0.45325
42	0.50766	0.50147	0.49543	0.48954	0.48379	0.47818	0.47269	0.46734
43	0.52354	0.51710	0.51082	0.50469	0.49872	0.49288	0.48719	0.48162
44	0.53967	0.53297	0.52644	0.52008	0.51387	0.50781	0.50189	0.49611
45	0.55606	0.54910	0.54232	0.53570	0.52925	0.52296	0.51682	0.51082
46	0.57273	0.56549	0.55845	0.55158	0.54488	0.53834	0.53197	0.52575
47	0.58968	0.58216	0.57484	0.56771	0.56075	0.55397	0.54735	0.54090
48	0.60692	0.59911	0.59151	0.58410	0.57688	0.56984	0.56298	0.55628

M \ N	105	106	107	108	109	110	111	112
49	0.62446	0.61635	0.60846	0.60077	0.59327	0.58597	0.57885	0.57191
50	0.64232	0.63389	0.62570	0.61771	0.60994	0.60236	0.59498	0.58778
51	0.66050	0.65175	0.64324	0.63496	0.62689	0.61903	0.61137	0.60391
52	0.67902	0.66993	0.66110	0.65250	0.64413	0.63598	0.62804	0.62030
53	0.69789	0.68845	0.67928	0.67036	0.66167	0.65322	0.64499	0.63697
54	0.71712	0.70732	0.69780	0.68854	0.67953	0.67077	0.66223	0.65392
55	0.73673	0.72655	0.71667	0.70706	0.69771	0.68862	0.67977	0.67116
56	0.75673	0.74616	0.73590	0.72593	0.71623	0.70680	0.69763	0.68870

M \ N	105	106	107	108	109	110	111	112
57	0.77713	0.76616	0.75550	0.74516	0.73510	0.72532	0.71581	0.70656
58	0.79797	0.78657	0.77550	0.76476	0.75433	0.74419	0.73433	0.72474
59	0.81924	0.80740	0.79591	0.78476	0.77394	0.76342	0.75320	0.74326
60	0.84098	0.82868	0.81675	0.80517	0.79394	0.78303	0.77243	0.76213
61	0.86320	0.85042	0.83802	0.82601	0.81435	0.80303	0.79204	0.78136
62	0.88593	0.87264	0.85976	0.84728	0.83518	0.82344	0.81204	0.80097
63	0.90919	0.89537	0.88198	0.86902	0.85646	0.84427	0.83245	0.82097
64	0.93300	0.91862	0.90471	0.89124	0.87820	0.86555	0.85328	0.84138

M \ N	105	106	107	108	109	110	111	112
65	0.95739	0.94243	0.92797	0.91397	0.90042	0.88729	0.87456	0.86221
66	0.98239	0.96682	0.95178	0.93723	0.92315	0.90951	0.89630	0.88348
67	1.00803	0.99182	0.97617	0.96104	0.94640	0.93224	0.91852	0.90522
68	1.03434	1.01746	1.00117	0.98543	0.97021	0.95549	0.94124	0.92745
69	1.06137	1.04378	1.02681	1.01043	0.99460	0.97930	0.96450	0.95017
70	1.08915	1.07081	1.05312	1.03607	1.01960	1.00369	0.98831	0.97343
71	1.11772	1.09858	1.08015	1.06238	1.04524	1.02869	1.01270	0.99724
72	1.14713	1.12715	1.10793	1.08941	1.07156	1.05433	1.03770	1.02163

M \ N	105	106	107	108	109	110	111	112
73	1.17744	1.15657	1.13650	1.11719	1.09858	1.08065	1.06334	1.04663
74	1.20869	1.18687	1.16591	1.14576	1.12636	1.10768	1.08966	1.07227
75	1.24094	1.21812	1.19621	1.17517	1.15493	1.13545	1.11668	1.09859
76	1.27428	1.25038	1.22746	1.20547	1.18435	1.16402	1.14446	1.12561
77	1.30876	1.28371	1.25972	1.23672	1.21465	1.19344	1.17303	1.15339
78	1.34447	1.31819	1.29306	1.26898	1.24590	1.22374	1.20245	1.18196
79	1.38151	1.35391	1.32754	1.30232	1.27816	1.25499	1.23275	1.21137
80	1.41997	1.39094	1.36325	1.33680	1.31149	1.28725	1.26400	1.24168

M \ N	105	106	107	108	109	110	111	112
81	1.45997	1.42941	1.40029	1.37251	1.34597	1.32058	1.29626	1.27293
82	1.50164	1.46941	1.43875	1.40955	1.38169	1.35506	1.32959	1.30519
83	1.54512	1.51107	1.47875	1.44801	1.41872	1.39078	1.36407	1.33852
84	1.59057	1.55455	1.52042	1.48801	1.45719	1.42781	1.39979	1.37300
85	1.63819	1.60001	1.56390	1.52968	1.49719	1.46628	1.43682	1.40872
86	1.68819	1.64762	1.60935	1.57316	1.53885	1.50628	1.47529	1.44575
87	1.74082	1.69762	1.65697	1.61861	1.58233	1.54794	1.51529	1.48421
88	1.79638	1.75026	1.70697	1.66623	1.62778	1.59142	1.55695	1.52421

M \ N	105	106	107	108	109	110	111	112
89	1.85520	1.80581	1.75960	1.71623	1.67540	1.63688	1.60043	1.56588
90	1.91770	1.86464	1.81516	1.76886	1.72540	1.68449	1.64588	1.60936
91	1.98437	1.92714	1.87398	1.82442	1.77804	1.73449	1.69350	1.65481
92	2.05580	1.99380	1.93648	1.88324	1.83359	1.78713	1.74350	1.70243
93	2.13272	2.06523	2.00315	1.94574	1.89241	1.84268	1.79614	1.75243
94	2.21605	2.14215	2.07458	2.01241	1.95491	1.90151	1.85169	1.80506
95	2.30696	2.22549	2.15150	2.08384	2.02158	1.96401	1.91051	1.86062
96	2.40696	2.31640	2.23483	2.16076	2.09301	2.03067	1.97301	1.91944

M \ N	105	106	107	108	109	110	111	112
97	2.51807	2.41640	2.32574	2.24409	2.16993	2.10210	2.03968	1.98194
98	2.64307	2.52751	2.42574	2.33500	2.25327	2.17902	2.11111	2.04861
99	2.78593	2.65251	2.53685	2.43500	2.34418	2.26236	2.18803	2.12004
100	2.95260	2.79536	2.66185	2.54611	2.44418	2.35327	2.27137	2.19696
101	3.15260	2.96203	2.80471	2.67111	2.55529	2.45327	2.36228	2.28029
102	3.40260	3.16203	2.97138	2.81397	2.68029	2.56438	2.46228	2.37120
103	3.73593	3.41203	3.17138	2.98064	2.82314	2.68938	2.57339	2.47120
104	4.23593	3.74536	3.42138	3.18064	2.98981	2.83223	2.69839	2.58232

M \ N	105	106	107	108	109	110	111	112
105	5.23593	4.24536	3.75471	3.43064	3.18981	2.99890	2.84124	2.70732
106		5.24536	4.25471	3.76397	3.43981	3.19890	3.00791	2.85017
107			5.25471	4.26397	3.77314	3.44890	3.20791	3.01684
108				5.26397	4.27314	3.78223	3.45791	3.21684
109					5.27314	4.28223	3.79124	3.46684
110						5.28223	4.29124	3.80017
111							5.29124	4.30017
112								5.30017

AD-A058 263 AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OHIO F/G 12/1
ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION. VOLUM--ETC(U)
1970 H L HARTER

UNCLASSIFIED

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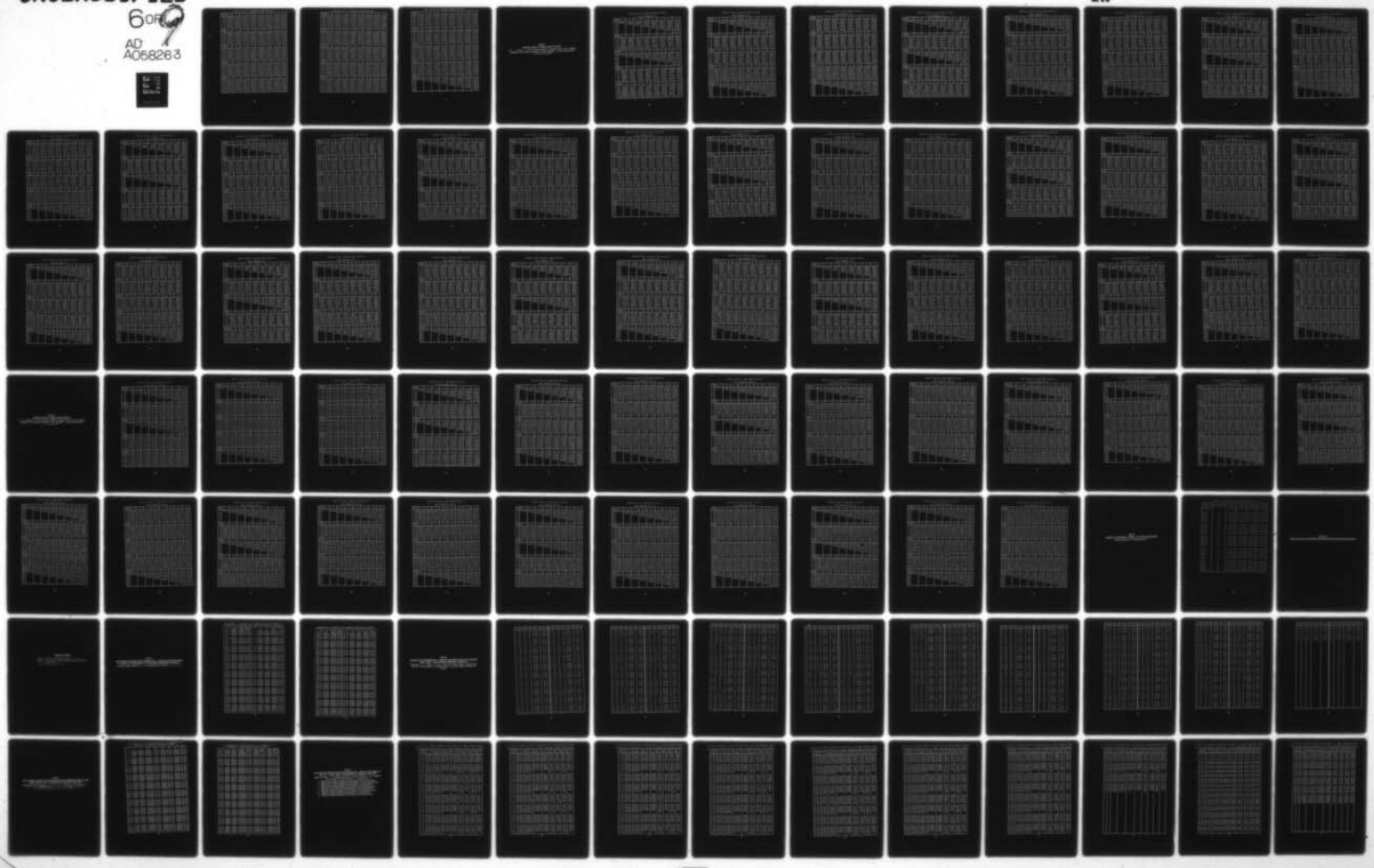
AD A058263



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EXPECTED VALUES OF EXPONENTIAL ORDER STATISTICS

M \ N	113	114	115	116	117	118	119	120
1	0.00885	0.00877	0.00870	0.00862	0.00855	0.00847	0.00840	0.00833
2	0.01778	0.01762	0.01747	0.01732	0.01717	0.01702	0.01688	0.01674
3	0.02679	0.02655	0.02632	0.02609	0.02586	0.02564	0.02542	0.02521
4	0.03588	0.03556	0.03525	0.03494	0.03464	0.03434	0.03405	0.03376
5	0.04505	0.04465	0.04425	0.04387	0.04348	0.04311	0.04274	0.04238
6	0.05431	0.05382	0.05335	0.05288	0.05241	0.05196	0.05151	0.05107
7	0.06366	0.06308	0.06252	0.06197	0.06142	0.06089	0.06036	0.05985
8	0.07309	0.07243	0.07178	0.07114	0.07051	0.06990	0.06929	0.06870

M \ N	113	114	115	116	117	118	119	120
9	0.08262	0.08186	0.08112	0.08040	0.07969	0.07899	0.07830	0.07762
10	0.09223	0.09139	0.09056	0.08975	0.08895	0.08816	0.08739	0.08663
11	0.10194	0.10100	0.10008	0.09918	0.09829	0.09742	0.09657	0.09572
12	0.11174	0.11071	0.10970	0.10870	0.10773	0.10677	0.10582	0.10490
13	0.12164	0.12052	0.11941	0.11832	0.11725	0.11620	0.11517	0.11416
14	0.13164	0.13042	0.12921	0.12803	0.12687	0.12573	0.12460	0.12350
15	0.14175	0.14042	0.13911	0.13783	0.13657	0.13534	0.13413	0.13294
16	0.15195	0.15052	0.14911	0.14773	0.14638	0.14505	0.14374	0.14246

M \ N	113	114	115	116	117	118	119	120
17	0.16226	0.16072	0.15921	0.15773	0.15628	0.15485	0.15345	0.15208
18	0.17268	0.17103	0.16942	0.16783	0.16628	0.16475	0.16326	0.16179
19	0.18320	0.18145	0.17973	0.17804	0.17638	0.17475	0.17316	0.17159
20	0.19384	0.19197	0.19014	0.18835	0.18658	0.18486	0.18316	0.18149
21	0.20459	0.20261	0.20067	0.19876	0.19689	0.19506	0.19326	0.19149
22	0.21546	0.21336	0.21131	0.20929	0.20731	0.20537	0.20346	0.20159
23	0.22645	0.22423	0.22206	0.21993	0.21784	0.21579	0.21377	0.21180
24	0.23756	0.23522	0.23293	0.23068	0.22848	0.22631	0.22419	0.22211

M \ N	113	114	115	116	117	118	119	120
25	0.24880	0.24633	0.24392	0.24155	0.23923	0.23695	0.23471	0.23252
26	0.26016	0.25757	0.25503	0.25254	0.25010	0.24770	0.24535	0.24305
27	0.27166	0.26893	0.26627	0.26365	0.26109	0.25857	0.25611	0.25369
28	0.28328	0.28043	0.27763	0.27489	0.27220	0.26956	0.26698	0.26444
29	0.29505	0.29206	0.28912	0.28625	0.28343	0.28067	0.27796	0.27531
30	0.30695	0.30382	0.30075	0.29774	0.29480	0.29191	0.28908	0.28630
31	0.31900	0.31573	0.31252	0.30937	0.30629	0.30327	0.30031	0.29741
32	0.33120	0.32777	0.32442	0.32114	0.31792	0.31477	0.31168	0.30864

M \ N	113	114	115	116	117	118	119	120
33	0.34354	0.33997	0.33647	0.33304	0.32968	0.32639	0.32317	0.32001
34	0.35604	0.35231	0.34866	0.34509	0.34159	0.33816	0.33480	0.33150
35	0.36870	0.36481	0.36101	0.35729	0.35364	0.35006	0.34656	0.34313
36	0.38152	0.37747	0.37351	0.36963	0.36583	0.36211	0.35847	0.35490
37	0.39451	0.39029	0.38617	0.38213	0.37818	0.37431	0.37051	0.36680
38	0.40767	0.40328	0.39899	0.39479	0.39068	0.38665	0.38271	0.37885
39	0.42100	0.41644	0.41198	0.40761	0.40334	0.39915	0.39506	0.39104
40	0.43451	0.42977	0.42513	0.42060	0.41616	0.41181	0.40756	0.40339

M \ N	113	114	115	116	117	118	119	120
41	0.44821	0.44328	0.43847	0.43375	0.42914	0.42463	0.42021	0.41589
42	0.46210	0.45698	0.45198	0.44709	0.44230	0.43762	0.43303	0.42855
43	0.47618	0.47087	0.46568	0.46060	0.45563	0.45078	0.44602	0.44137
44	0.49047	0.48496	0.47957	0.47430	0.46915	0.46411	0.45918	0.45435
45	0.50496	0.49924	0.49365	0.48819	0.48285	0.47762	0.47251	0.46751
46	0.51967	0.51374	0.50794	0.50227	0.49674	0.49132	0.48603	0.48085
47	0.53459	0.52844	0.52243	0.51656	0.51082	0.50521	0.49972	0.49436
48	0.54975	0.54337	0.53714	0.53105	0.52511	0.51929	0.51361	0.50806

M \ N	113	114	115	116	117	118	119	120
49	0.56513	0.55852	0.55206	0.54576	0.53960	0.53358	0.52770	0.52195
50	0.58076	0.57390	0.56721	0.56068	0.55430	0.54807	0.54198	0.53603
51	0.59663	0.58953	0.58260	0.57583	0.56923	0.56278	0.55648	0.55032
52	0.61276	0.60540	0.59822	0.59122	0.58438	0.57770	0.57118	0.56481
53	0.62915	0.62153	0.61410	0.60684	0.59977	0.59286	0.58611	0.57952
54	0.64582	0.63792	0.63023	0.62272	0.61539	0.60824	0.60126	0.59444
55	0.66277	0.65459	0.64662	0.63885	0.63126	0.62387	0.61664	0.60959
56	0.68001	0.67154	0.66329	0.65524	0.64739	0.63974	0.63227	0.62498

M \ N	113	114	115	116	117	118	119	120
57	0.69755	0.68878	0.68023	0.67191	0.66379	0.65587	0.64814	0.64060
58	0.71541	0.70632	0.69748	0.68886	0.68045	0.67226	0.66427	0.65648
59	0.73359	0.72418	0.71502	0.70610	0.69740	0.68893	0.68066	0.67260
60	0.75211	0.74236	0.73288	0.72364	0.71464	0.70588	0.69733	0.68900
61	0.77098	0.76088	0.75106	0.74150	0.73219	0.72312	0.71428	0.70566
62	0.79021	0.77975	0.76958	0.75968	0.75004	0.74066	0.73152	0.72261
63	0.80982	0.79898	0.78845	0.77820	0.76823	0.75852	0.74907	0.73986
64	0.82982	0.81859	0.80768	0.79707	0.78675	0.77670	0.76692	0.75740

M \ N	113	114	115	116	117	118	119	120
65	0.85022	0.83859	0.82728	0.81630	0.80561	0.79522	0.78510	0.77526
66	0.87106	0.85900	0.84728	0.83590	0.82484	0.81409	0.80362	0.79344
67	0.89233	0.87983	0.86769	0.85590	0.84445	0.83332	0.82249	0.81196
68	0.91407	0.90111	0.88853	0.87631	0.86445	0.85293	0.84172	0.83082
69	0.93630	0.92285	0.90980	0.89715	0.88486	0.87293	0.86133	0.85006
70	0.95902	0.94507	0.93154	0.91842	0.90569	0.89333	0.88133	0.86966
71	0.98228	0.96780	0.95376	0.94016	0.92697	0.91417	0.90174	0.88966
72	1.00609	0.99105	0.97649	0.96238	0.94871	0.93544	0.92257	0.91007

M \ N	113	114	115	116	117	118	119	120
73	1.03048	1.01486	0.99975	0.98511	0.97093	0.95718	0.94385	0.93090
74	1.05548	1.03925	1.02356	1.00837	0.99366	0.97941	0.96559	0.95218
75	1.08112	1.06425	1.04795	1.03218	1.01691	1.00213	0.98781	0.97392
76	1.10744	1.08989	1.07295	1.05657	1.04072	1.02539	1.01054	0.99614
77	1.13446	1.11621	1.09859	1.08157	1.06511	1.04920	1.03379	1.01887
78	1.16224	1.14323	1.12490	1.10721	1.09011	1.07359	1.05760	1.04213
79	1.19081	1.17101	1.15193	1.13352	1.11575	1.09859	1.08199	1.06594
80	1.22022	1.19958	1.17971	1.16055	1.14207	1.12423	1.10699	1.09033

M \ N	113	114	115	116	117	118	119	120
81	1.25053	1.22900	1.20828	1.18833	1.16910	1.15055	1.13263	1.11533
82	1.28178	1.25930	1.23769	1.21690	1.19688	1.17757	1.15895	1.14097
83	1.31403	1.29055	1.26799	1.24631	1.22545	1.20535	1.18598	1.16728
84	1.34737	1.32281	1.29924	1.27661	1.25486	1.23392	1.21375	1.19431
85	1.38185	1.35614	1.33150	1.30786	1.28516	1.26333	1.24232	1.22209
86	1.41756	1.39062	1.36484	1.34012	1.31641	1.29364	1.27174	1.25066
87	1.45460	1.42634	1.39932	1.37346	1.34867	1.32489	1.30204	1.28007
88	1.49306	1.46337	1.43503	1.40794	1.38200	1.35714	1.33329	1.31037

M \ N	113	114	115	116	117	118	119	120
89	1.53306	1.50184	1.47207	1.44365	1.41649	1.39048	1.36555	1.34162
90	1.57473	1.54184	1.51053	1.48069	1.45220	1.42496	1.39888	1.37388
91	1.61821	1.58350	1.55053	1.51915	1.48924	1.46067	1.43336	1.40721
92	1.66366	1.62698	1.59220	1.55915	1.52770	1.49771	1.46908	1.44170
93	1.71128	1.67243	1.63568	1.60082	1.56770	1.53617	1.50612	1.47741
94	1.76128	1.72005	1.68113	1.64430	1.60937	1.57617	1.54458	1.51445
95	1.81391	1.77005	1.72875	1.68975	1.65284	1.61784	1.58458	1.55291
96	1.86947	1.82269	1.77875	1.73737	1.69830	1.66132	1.62624	1.59291

M \ N	113	114	115	116	117	118	119	120
97	1.92829	1.87824	1.83138	1.78737	1.74592	1.70677	1.66972	1.63458
98	1.99079	1.93706	1.88694	1.84000	1.79592	1.75439	1.71518	1.67806
99	2.05746	1.99956	1.94576	1.89556	1.84855	1.80439	1.76280	1.72351
100	2.12889	2.06623	2.00826	1.95438	1.90410	1.85702	1.81280	1.77113
101	2.20581	2.13766	2.07493	2.01688	1.96293	1.91258	1.86543	1.82113
102	2.28914	2.21458	2.14636	2.08355	2.02543	1.97140	1.92098	1.87376
103	2.38003	2.29792	2.22328	2.15498	2.09209	2.03390	1.97981	1.92932
104	2.48005	2.38883	2.30661	2.23190	2.16352	2.10057	2.04231	1.98814

M \ N	113	114	115	116	117	118	119	120
105	2.59116	2.48883	2.39752	2.31523	2.24045	2.17200	2.10897	2.05064
106	2.71616	2.59994	2.49752	2.40614	2.32378	2.24892	2.18040	2.11731
107	2.85902	2.72494	2.60863	2.50614	2.41469	2.33225	2.25732	2.18873
108	3.02569	2.86779	2.73363	2.61725	2.51469	2.42316	2.34066	2.26566
109	3.22569	3.03446	2.87649	2.74225	2.62580	2.52316	2.43157	2.34899
110	3.47569	3.23446	3.04316	2.88511	2.75080	2.63427	2.53157	2.43990
111	3.80902	3.48446	3.24316	3.05178	2.89366	2.75927	2.64268	2.53990
112	4.30902	3.81779	3.49316	3.25178	3.06032	2.90213	2.76768	2.65101

M \ N	113	114	115	116	117	118	119	120
113	5.30902	4.31779	3.82649	3.50178	3.26032	3.06880	2.91053	2.77601
114		5.31779	4.32649	3.83511	3.51032	3.26880	3.07720	2.91887
115			5.32649	4.33511	3.84366	3.51880	3.27720	3.08553
116				5.33511	4.34366	3.85213	3.52720	3.28553
117					5.34366	4.35213	3.86053	3.53553
118						5.35213	4.36053	3.86887
119							5.36053	4.36887
120								5.36887

Table C3

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

[$E(x_{M,N})$, where $x_{M,N}$ is the Mth order statistic of a sample of size N from a Weibull population with location parameter 0, scale parameter 1, and shape parameter $K = 0.5(0.5)4.0(1.0)8.0$]

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=0.5

M \ N	1	2	3	4	5	6	7	8
1	2.00000	.50000	.22222	.12500	.08000	.05556	.04082	.03125
2		3.50000	1.05556	.51389	.30500	.20222	.14399	.10778
3			4.72222	1.59722	.82722	.51056	.34780	.25262
4				5.76389	2.11056	1.14389	.72756	.50643
5					6.67722	2.59389	1.45613	.94869
6						7.49389	3.04899	1.76060
7							8.23471	3.47846
8								8.91417

M \ N	9	10	11	12	13	14	15	16
1	.02469	.02000	.01653	.01389	.01183	.01020	.00889	.00781
2	.08372	.06691	.05471	.04557	.03854	.03303	.02862	.02503
3	.19200	.15094	.12183	.10042	.08421	.07164	.06170	.05369
4	.37387	.28779	.22858	.18605	.15444	.13030	.11142	.09639
5	.67213	.50300	.39140	.31364	.25717	.21481	.18220	.15653
6	1.16995	.84126	.63692	.50027	.40399	.33342	.28005	.23867
7	2.05592	1.38907	1.01154	.77356	.61260	.49809	.41346	.34902
8	3.88489	2.34172	1.60481	1.18152	.91153	.72711	.59481	.49632

M \ N	9	10	11	12	13	14	15	16
9	9.54283	4.27069	2.61806	1.81645	1.35025	1.04985	.84287	.69329
10		10.12862	4.63794	2.88526	2.02365	1.51714	1.18784	.95921
11			10.67769	4.98847	3.14374	2.22626	1.68180	1.32501
12				11.19489	5.32388	3.39397	2.42424	1.84397
13					11.68414	5.64553	3.63640	2.61767
14						12.14865	5.95463	3.87149
15							12.59108	6.25222
16								13.01368

M \ N	17	18	19	20	21	22	23	24
1	.00692	.00617	.00554	.00500	.00454	.00413	.00378	.00347
2	.02209	.01963	.01756	.01580	.01430	.01300	.01187	.01088
3	.04715	.04174	.03721	.03338	.03011	.02730	.02487	.02275
4	.08421	.07421	.06590	.05891	.05298	.04790	.04353	.03972
5	.13596	.11921	.10539	.09385	.08411	.07582	.06870	.06254
6	.20590	.17950	.15790	.14001	.12500	.11230	.10145	.09211
7	.29874	.25871	.22629	.19966	.17751	.15888	.14305	.12949
8	.42085	.36164	.31427	.27575	.24397	.21744	.19506	.17598

M \ N	17	18	19	20	21	22	23	24
9	.58123	.49487	.42677	.37206	.32738	.29040	.25942	.23320
10	.79290	.66759	.57053	.49365	.43163	.38080	.33858	.30312
11	1.07563	.89315	.75495	.64740	.56188	.49262	.43567	.38824
12	1.46104	1.19176	.99367	.84293	.72516	.63114	.55474	.49174
13	2.00353	1.59568	1.30731	1.09416	.93127	.80351	.70117	.61775
14	2.80664	2.16039	1.72878	1.42208	1.19439	1.01972	.88223	.77175
15	4.09967	2.99128	2.31454	1.86022	1.53592	1.29421	1.10810	.96115
16	6.53922	4.32135	3.17174	2.46598	1.98993	1.64873	1.39346	1.19628

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=0.5

M \ N	17	18	19	20	21	22	23	24
17	13.41833	6.81646	4.53690	3.34818	2.61474	2.11789	1.76040	1.49205
18		13.80667	7.08464	4.74667	3.52076	2.76088	2.24406	1.87090
19			14.18012	7.34441	4.95099	3.68962	2.90444	2.36844
20				14.53989	7.59635	5.15016	3.85492	3.04549
21					14.88707	7.84097	5.34445	4.01680
22						15.22260	8.07874	5.53411
23							15.54732	8.31007
24								15.86198

M \ N	25	26	27	28	29	30	31	32
1	.00320	.00296	.00274	.00255	.00238	.00222	.00208	.00195
2	.01001	.00924	.00855	.00794	.00739	.00690	.00645	.00605
3	.02089	.01925	.01779	.01649	.01534	.01429	.01336	.01251
4	.03640	.03347	.03089	.02859	.02654	.02471	.02305	.02156
5	.05718	.05248	.04834	.04467	.04140	.03848	.03586	.03349
6	.08400	.07692	.07071	.06522	.06035	.05600	.05211	.04861
7	.11778	.10759	.09868	.09084	.08390	.07773	.07221	.06727
8	.15960	.14541	.13305	.12221	.11265	.10417	.09663	.08987

M \ N	25	26	27	28	29	30	31	32
9	.21080	.19151	.17477	.16015	.14731	.13596	.12588	.11689
10	.27302	.24724	.22499	.20564	.18870	.17379	.16060	.14886
11	.34827	.31426	.28507	.25982	.23781	.21852	.20150	.18642
12	.43910	.39464	.35672	.32410	.29582	.27114	.24945	.23030
13	.54876	.49097	.44204	.40022	.36417	.33285	.30547	.28138
14	.68144	.60654	.54366	.49030	.44459	.40512	.37077	.34068
15	.84271	.74563	.66493	.59702	.53927	.48971	.44683	.40945
16	1.04010	.91390	.81019	.72378	.65092	.58883	.53545	.48919

M \ N	25	26	27	28	29	30	31	32
17	1.28413	1.11899	.98519	.87500	.78299	.70524	.63888	.58172
18	1.58990	1.37156	1.19769	1.05649	.93995	.84244	.75989	.68931
19	1.98018	1.68695	1.45049	1.27613	1.12771	1.00496	.90205	.81479
20	2.49105	2.08821	1.78314	1.54487	1.35425	1.19878	1.06995	.96176
21	3.18410	2.61190	2.19498	1.87845	1.63065	1.43198	1.26964	1.13486
22	4.17541	3.32034	2.73102	2.30050	1.97285	1.71579	1.50929	1.34023
23	5.71939	4.33088	3.45427	2.84844	2.40475	2.06632	1.80027	1.58614
24	8.53534	5.90049	4.48334	3.58598	2.96419	2.50775	2.15886	1.88406

M \ N	25	26	27	28	29	30	31	32
25	16.16726	8.75491	6.07764	4.63290	3.71552	3.07830	2.60950	2.25047
26		16.46375	8.96910	6.25101	4.77968	3.84296	3.19081	2.71004
27			16.75201	9.17818	6.42078	4.92379	3.96837	3.30176
28				17.03252	9.38243	6.58711	5.06533	4.09182
29					17.30574	9.58210	6.75016	5.20440
30						17.57207	9.77740	6.91006
31							17.83189	9.96856
32								18.08555

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=0.5

M \ N	33	34	35	36	37	38	39	40
1	.00184	.00173	.00163	.00154	.00146	.00139	.00131	.00125
2	.00568	.00535	.00504	.00476	.00451	.00427	.00405	.00385
3	.01174	.01103	.01039	.00981	.00927	.00878	.00832	.00790
4	.02021	.01898	.01787	.01684	.01590	.01504	.01425	.01352
5	.03136	.02942	.02766	.02605	.02458	.02323	.02198	.02084
6	.04545	.04260	.04000	.03763	.03547	.03349	.03167	.03000
7	.06282	.05879	.05515	.05183	.04880	.04603	.04350	.04116
8	.08380	.07833	.07338	.06889	.06480	.06106	.05764	.05450

M \ N	33	34	35	36	37	38	39	40
9	.10883	.10158	.09504	.08911	.08372	.07881	.07432	.07020
10	.13837	.12896	.12049	.11283	.10587	.09955	.09378	.08850
11	.17298	.16096	.15015	.14041	.13159	.12358	.11629	.10962
12	.21329	.19812	.18453	.17230	.16125	.15125	.14215	.13386
13	.26006	.24111	.22418	.20899	.19530	.18294	.17172	.16151
14	.31417	.29068	.26976	.25105	.23425	.21909	.20538	.19292
15	.37666	.34772	.32205	.29916	.27866	.26023	.24358	.22851
16	.44880	.41331	.38195	.35410	.32923	.30693	.28685	.26871

M \ N	33	34	35	36	37	38	39	40
17	.53210	.48872	.45055	.41678	.38674	.35989	.33579	.31407
18	.62842	.57548	.52913	.48830	.45212	.41990	.39108	.36517
19	.74005	.67548	.61926	.56997	.52649	.48792	.45353	.42274
20	.86986	.79103	.72283	.66336	.61116	.56506	.52411	.48757
21	1.02149	.92504	.84219	.77040	.70773	.65265	.60395	.56065
22	1.19965	1.08120	.98028	.89347	.81815	.75232	.69439	.64312
23	1.41052	1.26425	1.14083	1.03553	.94482	.86603	.79708	.73634
24	1.66249	1.48048	1.32865	1.20035	1.09074	.99620	.91399	.84197

M \ N	33	34	35	36	37	38	39	40
25	1.96714	1.73833	1.55007	1.39280	1.25972	1.14589	1.04759	.96201
26	2.34113	2.04952	1.81363	1.61927	1.45667	1.31892	1.20093	1.09894
27	2.80936	2.43085	2.13117	1.88839	1.68806	1.52025	1.37791	1.25585
28	3.41118	2.90749	2.51965	2.21210	1.96258	1.75642	1.58352	1.43667
29	4.21336	3.51911	3.00445	2.60752	2.29230	2.03621	1.82435	1.64645
30	5.34110	4.33306	3.62559	3.10025	2.69448	2.37177	2.10926	1.89183
31	7.06696	5.47550	4.45097	3.73066	3.19493	2.78054	2.45053	2.18174
32	10.15576	7.22097	5.60770	4.56715	3.83435	3.28851	2.86570	2.52856

M \ N	33	34	35	36	37	38	39	40
33	18.33336	10.33918	7.37222	5.73777	4.68165	3.93670	3.38100	2.94998
34		18.57560	10.51900	7.52081	5.86578	4.79453	4.03773	3.47242
35			18.81256	10.69536	7.66684	5.99181	4.90582	4.13749
36				19.04448	10.86842	7.81041	6.11592	5.01558
37					19.27160	11.03831	7.95162	6.23818
38						19.49412	11.20516	8.09055
39							19.71225	11.36909
40								19.92617

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=1.0

M \ N	1	2	3	4	5	6	7	8
1	1.00000	.50000	.33333	.25000	.20000	.16667	.14286	.12500
2		1.50000	.83333	.58333	.45000	.36667	.30952	.26786
3			1.83333	1.08333	.78333	.61667	.50952	.43452
4				2.08333	1.28333	.95000	.75952	.63452
5					2.28333	1.45000	1.09286	.88452
6						2.45000	1.59286	1.21786
7							2.59286	1.71786
8								2.71786

M \ N	9	10	11	12	13	14	15	16
1	.11111	.10000	.09091	.08333	.07692	.07143	.06667	.06250
2	.23611	.21111	.19091	.17424	.16026	.14835	.13810	.12917
3	.37897	.33611	.30202	.27424	.25117	.23168	.21502	.20060
4	.54563	.47897	.42702	.38535	.35117	.32259	.29835	.27752
5	.74563	.64563	.56988	.51035	.46228	.42259	.38926	.36085
6	.99563	.84563	.73654	.65321	.58728	.53371	.48926	.45176
7	1.32897	1.09563	.93654	.81988	.73013	.65871	.60037	.55176
8	1.82897	1.42897	1.18654	1.01988	.89680	.80156	.72537	.66287

M \ N	9	10	11	12	13	14	15	16
9	2.82897	1.92897	1.51988	1.26988	1.09680	.96823	.86823	.78787
10		2.92897	2.01988	1.60321	1.34680	1.16823	1.03490	.93073
11			3.01988	2.10321	1.68013	1.41823	1.23490	1.09740
12				3.10321	2.18013	1.75156	1.48490	1.29740
13					3.18013	2.25156	1.81823	1.54740
14						3.25156	2.31823	1.88073
15							3.31823	2.38073
16								3.38073

M \ N	17	18	19	20	21	22	23	24
1	.05882	.05556	.05263	.05000	.04762	.04545	.04348	.04167
2	.12132	.11438	.10819	.10263	.09762	.09307	.08893	.08514
3	.18799	.17688	.16701	.15819	.15025	.14307	.13655	.13060
4	.25942	.24355	.22951	.21701	.20581	.19571	.18655	.17822
5	.33634	.31497	.29618	.27951	.26463	.25126	.23918	.22822
6	.41968	.39190	.36761	.34618	.32713	.31008	.29474	.28085
7	.51058	.47523	.44453	.41761	.39380	.37258	.35356	.33641
8	.61058	.56614	.52786	.49453	.46522	.43925	.41606	.39523

M \ N	17	18	19	20	21	22	23	24
9	.72170	.66614	.61877	.57786	.54215	.51068	.48273	.45773
10	.84670	.77725	.71877	.66877	.62548	.58760	.55416	.52440
11	.98955	.90225	.82988	.76877	.71639	.67094	.63108	.59582
12	1.15622	1.04511	.95488	.87988	.81639	.76184	.71441	.67275
13	1.35622	1.21177	1.09774	1.00488	.92750	.86184	.80532	.75608
14	1.60622	1.41177	1.26441	1.14774	1.05250	.97296	.90532	.84699
15	1.93955	1.66177	1.46441	1.31441	1.19536	1.09796	1.01643	.94699
16	2.43955	1.99511	1.71441	1.51441	1.36203	1.24081	1.14143	1.05810

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=1.0

M \ N	17	18	19	20	21	22	23	24
17	3.43955	2.49511	2.04774	1.76441	1.56203	1.40748	1.28429	1.18310
18		3.49511	2.54774	2.09774	1.81203	1.60748	1.45096	1.32596
19			3.54774	2.59774	2.14536	1.85748	1.65096	1.49262
20				3.59774	2.64536	2.19081	1.90096	1.69262
21					3.64536	2.69081	2.23429	1.94262
22						3.69081	2.73429	2.27596
23							3.73429	2.77596
24								3.77596

M \ N	25	26	27	28	29	30	31	32
1	.04000	.03846	.03704	.03571	.03448	.03333	.03226	.03125
2	.08167	.07846	.07550	.07275	.07020	.06782	.06559	.06351
3	.12514	.12013	.11550	.11121	.10723	.10353	.10007	.09684
4	.17060	.16361	.15717	.15121	.14570	.14057	.13579	.13132
5	.21822	.20906	.20064	.19288	.18570	.17903	.17283	.16704
6	.26822	.25668	.24610	.23636	.22736	.21903	.21129	.20408
7	.32085	.30668	.29372	.28181	.27084	.26070	.25129	.24254
8	.37641	.35931	.34372	.32943	.31630	.30417	.29295	.28254

M \ N	25	26	27	28	29	30	31	32
9	.43523	.41487	.39635	.37943	.36391	.34963	.33643	.32420
10	.49773	.47369	.45190	.43206	.41391	.39725	.38189	.36768
11	.56440	.53619	.51073	.48762	.46655	.44725	.42951	.41314
12	.63582	.60286	.57323	.54644	.52210	.49988	.47951	.46076
13	.71275	.67429	.63989	.60894	.58092	.55543	.53214	.51076
14	.79608	.75121	.71132	.67561	.64342	.61426	.58769	.56339
15	.88699	.83454	.78825	.74704	.71009	.67676	.64652	.61894
16	.98699	.92545	.87158	.82396	.78152	.74342	.70902	.67777

M \ N	25	26	27	28	29	30	31	32
17	1.09810	1.02545	.96249	.90729	.85844	.81485	.77568	.74027
18	1.22310	1.13656	1.06249	.99820	.94178	.89178	.84711	.80693
19	1.36596	1.26156	1.17360	1.09820	1.03269	.97511	.92403	.87836
20	1.53262	1.40442	1.29860	1.20931	1.13269	1.06602	1.00737	.95528
21	1.73262	1.57109	1.44146	1.33431	1.24380	1.16602	1.09828	1.03862
22	1.98262	1.77109	1.60812	1.47717	1.36880	1.27713	1.19828	1.12953
23	2.31596	2.02109	1.80812	1.64384	1.51165	1.40213	1.30939	1.22953
24	2.81596	2.35442	2.05812	1.84384	1.67832	1.54499	1.43439	1.34064

M \ N	25	26	27	28	29	30	31	32
25	3.81596	2.85442	2.39146	2.09384	1.87832	1.71165	1.57725	1.46564
26		3.85442	2.89146	2.42717	2.12832	1.91165	1.74391	1.60850
27			3.89146	2.92717	2.46165	2.16165	1.94391	1.77516
28				3.92717	2.96165	2.49499	2.19391	1.97516
29					3.96165	2.99499	2.52725	2.22516
30						3.99499	3.02725	2.55850
31							4.02725	3.05850
32								4.05850

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=1.0

M \ N	33	34	35	36	37	38	39	40
1	.03030	.02941	.02857	.02778	.02703	.02632	.02564	.02500
2	.06155	.05971	.05798	.05635	.05480	.05334	.05196	.05064
3	.09381	.09096	.08829	.08576	.08338	.08112	.07898	.07696
4	.12714	.12322	.11954	.11606	.11279	.10969	.10676	.10398
5	.16163	.15656	.15179	.14731	.14309	.13910	.13533	.13176
6	.19734	.19104	.18513	.17957	.17434	.16941	.16474	.16033
7	.23438	.22675	.21961	.21291	.20660	.20066	.19505	.18974
8	.27284	.26379	.25532	.24739	.23993	.23291	.22630	.22005

M \ N	33	34	35	36	37	38	39	40
9	.31284	.30225	.29236	.28310	.27442	.26625	.25856	.25130
10	.35451	.34225	.33082	.32014	.31013	.30073	.29189	.28356
11	.39798	.38392	.37082	.35860	.34717	.33645	.32637	.31689
12	.44344	.42740	.41249	.39860	.38563	.37348	.36209	.35137
13	.49106	.47285	.45597	.44027	.42563	.41194	.39912	.38709
14	.54106	.52047	.50142	.48375	.46729	.45194	.43758	.42412
15	.59369	.57047	.54904	.52920	.51077	.49361	.47758	.46258
16	.64925	.62310	.59904	.57682	.55623	.53709	.51925	.50258

M \ N	33	34	35	36	37	38	39	40
17	.70807	.67866	.65167	.62682	.60385	.58254	.56273	.54425
18	.77057	.73748	.70723	.67945	.65385	.63016	.60818	.58773
19	.83724	.79998	.76605	.73501	.70648	.68016	.65580	.63318
20	.90866	.86665	.82855	.79383	.76203	.73279	.70580	.68080
21	.98559	.93808	.89522	.85633	.82086	.78835	.75843	.73080
22	1.06892	1.01500	.96665	.92300	.88336	.84717	.81399	.78343
23	1.15983	1.09833	1.04357	.99443	.95002	.90967	.87281	.83899
24	1.25983	1.18924	1.12690	1.07135	1.02145	.97634	.93531	.89781

M \ N	33	34	35	36	37	38	39	40
25	1.37094	1.28924	1.21781	1.15468	1.09838	1.04777	1.00198	.96031
26	1.49594	1.40035	1.31781	1.24559	1.18171	1.12469	1.07341	1.02698
27	1.63880	1.52535	1.42892	1.34559	1.27262	1.20802	1.15033	1.09841
28	1.80546	1.66821	1.55392	1.45670	1.37262	1.29893	1.23367	1.17533
29	2.00546	1.83488	1.69678	1.58170	1.48373	1.39893	1.32457	1.25867
30	2.25546	2.03488	1.86345	1.72456	1.60873	1.51004	1.42457	1.34957
31	2.58880	2.28488	2.06345	1.89123	1.75159	1.63504	1.53569	1.44957
32	3.08880	2.61821	2.31345	2.09123	1.91825	1.77790	1.66069	1.56069

M \ N	33	34	35	36	37	38	39	40
33	4.08880	3.11821	2.64678	2.34123	2.11825	1.94457	1.80354	1.68569
34		4.11821	3.14678	2.67456	2.36825	2.14457	1.97021	1.82854
35			4.14678	3.17456	2.70159	2.39457	2.17021	1.99521
36				4.17456	3.20159	2.72790	2.42021	2.19521
37					4.20159	3.22790	2.75354	2.44521
38						4.22790	3.25354	2.77854
39							4.25354	3.27854
40								4.27854

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=1.5

M \ N	1	2	3	4	5	6	7	8
1	.90275	.56869	.43399	.35825	.30873	.27340	.24670	.22569
2		1.23680	.83809	.66121	.55634	.48541	.43361	.39378
3			1.43615	1.01497	.81853	.69819	.61492	.55307
4				1.57654	1.14593	.93888	.80921	.71800
5					1.68420	1.24945	1.03613	.90041
6						1.77114	1.33478	1.11757
7							1.84387	1.40718
8								1.90626

M \ N	9	10	11	12	13	14	15	16
1	.20864	.19449	.18252	.17223	.16328	.15541	.14842	.14217
2	.36203	.33601	.31423	.29566	.27963	.26560	.25322	.24218
3	.50491	.46612	.43406	.40703	.38387	.36377	.34611	.33046
4	.64939	.59543	.55160	.51514	.48422	.45760	.43439	.41394
5	.80377	.73034	.67212	.62452	.58470	.55077	.52143	.49576
6	.97773	.87719	.80021	.73876	.68824	.64578	.60944	.57792
7	1.18749	1.04475	.94135	.86165	.79770	.74487	.70027	.66199
8	1.46995	1.24866	1.10384	.99827	.91647	.85052	.79583	.74950

M \ N	9	10	11	12	13	14	15	16
9	1.96079	1.52528	1.30297	1.15663	1.04940	.96594	.89838	.84216
10		2.00918	1.57468	1.35175	1.20428	1.09576	1.01097	.94211
11			2.05263	1.61927	1.39598	1.24769	1.13816	1.05229
12				2.09203	1.65986	1.43643	1.28752	1.17719
13					2.12805	1.69710	1.47365	1.32430
14						2.16120	1.73148	1.50812
15							2.19189	1.76339
16								2.22046

M \ N	17	18	19	20	21	22	23	24
1	.13654	.13144	.12678	.12252	.11860	.11498	.11162	.10850
2	.23228	.22333	.21520	.20776	.20094	.19466	.18884	.18344
3	.31647	.30387	.29247	.28207	.27256	.26381	.25573	.24825
4	.39574	.37944	.36472	.35136	.33916	.32797	.31767	.30813
5	.47306	.45282	.43462	.41817	.40320	.38950	.37692	.36532
6	.55024	.52570	.50375	.48399	.46608	.44975	.43479	.42103
7	.62866	.59932	.57324	.54987	.52877	.50962	.49213	.47609
8	.70960	.67477	.64403	.61664	.59205	.56982	.54960	.53110

M \ N	17	18	19	20	21	22	23	24
9	.79439	.75314	.71704	.68510	.65660	.63096	.60774	.58658
10	.88462	.83565	.79325	.75606	.72311	.69364	.66708	.64300
11	.98235	.92380	.87381	.83043	.79231	.75847	.72816	.70080
12	1.09044	1.01960	.96017	.90930	.86508	.82616	.79154	.76049
13	1.21333	1.12587	1.05427	.99408	.94246	.89752	.85789	.82259
14	1.35845	1.24697	1.15891	1.08668	1.02584	.97358	.92800	.88775
15	1.54019	1.39030	1.27842	1.18987	1.11710	1.05570	1.00288	.95675
16	1.79314	1.57017	1.42013	1.30793	1.21897	1.14575	1.08387	1.03056

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=1.5

M \ N	17	18	19	20	21	22	23	24
17	2.24716	1.82102	1.59830	1.44818	1.33573	1.24643	1.17282	1.11053
18		2.27223	1.84722	1.62480	1.47464	1.36200	1.27242	1.19847
19			2.29584	1.87193	1.64982	1.49967	1.38688	1.29707
20				2.31815	1.89531	1.67353	1.52342	1.41052
21					2.33930	1.91749	1.69605	1.54600
22						2.35938	1.93858	1.71748
23							2.37851	1.95868
24								2.39676

M \ N	25	26	27	28	29	30	31	32
1	.10559	.10286	.10031	.09790	.09564	.09350	.09148	.08956
2	.17841	.17371	.16931	.16518	.16129	.15762	.15415	.15087
3	.24129	.23480	.22872	.22303	.21768	.21264	.20788	.20338
4	.29929	.29106	.28337	.27617	.26941	.26305	.25705	.25139
5	.35457	.34458	.33527	.32657	.31841	.31074	.30352	.29671
6	.40831	.39652	.38555	.37531	.36573	.35674	.34828	.34031
7	.46130	.44762	.43492	.42309	.41204	.40169	.39197	.38282
8	.51411	.49843	.48391	.47041	.45782	.44605	.43502	.42465

M \ N	25	26	27	28	29	30	31	32
9	.56721	.54939	.53292	.51765	.50345	.49019	.47778	.46613
10	.62102	.60088	.58232	.56515	.54922	.53438	.52052	.50754
11	.67596	.65326	.63243	.61321	.59542	.57890	.56349	.54909
12	.73243	.70691	.68357	.66212	.64232	.62397	.60691	.59099
13	.79089	.76220	.73608	.71217	.69017	.66984	.65099	.63344
14	.85186	.81958	.79033	.76367	.73924	.71675	.69594	.67663
15	.91595	.87953	.84673	.81699	.78985	.76495	.74201	.72077
16	.98394	.94267	.90577	.87251	.84232	.81474	.78943	.76608

M \ N	25	26	27	28	29	30	31	32
17	1.05679	1.00974	.96803	.93071	.89704	.86644	.83848	.81278
18	1.13582	1.08170	1.03427	.99218	.95448	.92044	.88948	.86115
19	1.22283	1.15987	1.10542	1.05765	1.01522	.97718	.94280	.91150
20	1.32051	1.24603	1.18279	1.12805	1.07997	1.03724	.99890	.96421
21	1.43302	1.34285	1.26817	1.20468	1.14969	1.10134	1.05833	1.01971
22	1.56752	1.45449	1.36419	1.28933	1.22563	1.17041	1.12182	1.07856
23	1.73793	1.58807	1.47501	1.38461	1.30959	1.24572	1.19029	1.14148
24	1.97787	1.75748	1.60773	1.49467	1.40418	1.32903	1.26500	1.20939

M \ N	25	26	27	28	29	30	31	32
25	2.41422	1.99624	1.77619	1.62658	1.51352	1.42297	1.34771	1.28353
26		2.43094	2.01384	1.79415	1.64467	1.53163	1.44103	1.36568
27			2.44698	2.03074	1.81140	1.66206	1.54905	1.45842
28				2.46239	2.04699	1.82799	1.67880	1.56584
29					2.47723	2.06263	1.84397	1.69494
30						2.49153	2.07771	1.85939
31							2.50532	2.09227
32								2.51864

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=1.5

M \ N	33	34	35	36	37	38	39	40
1	.08775	.08602	.08437	.08280	.08130	.07987	.07850	.07718
2	.14776	.14480	.14199	.13931	.13675	.13431	.13197	.12974
3	.19911	.19507	.19122	.18755	.18406	.18073	.17754	.17449
4	.24603	.24094	.23611	.23152	.22714	.22297	.21898	.21516
5	.29027	.28416	.27837	.27287	.26763	.26263	.25787	.25331
6	.33278	.32566	.31891	.31250	.30640	.30059	.29505	.28976
7	.37418	.36602	.35830	.35097	.34400	.33738	.33106	.32503
8	.41488	.40565	.39693	.38866	.38081	.37335	.36625	.35948

M \ N	33	34	35	36	37	38	39	40
9	.45518	.44485	.43510	.42586	.41711	.40879	.40088	.39335
10	.49534	.48387	.47304	.46280	.45310	.44390	.43516	.42684
11	.53558	.52289	.51094	.49965	.48898	.47886	.46926	.46012
12	.57609	.56212	.54898	.53659	.52489	.51381	.50331	.49333
13	.61706	.60171	.58731	.57376	.56097	.54889	.53744	.52658
14	.65865	.64184	.62609	.61129	.59736	.58421	.57177	.55999
15	.70105	.68266	.66546	.64934	.63418	.61990	.60642	.59366
16	.74445	.72434	.70558	.68803	.67157	.65608	.64148	.62768

M \ N	33	34	35	36	37	38	39	40
17	.78906	.76707	.74661	.72752	.70964	.69286	.67707	.66217
18	.83511	.81105	.78873	.76795	.74855	.73037	.71330	.69722
19	.88286	.85649	.83212	.80950	.78843	.76875	.75029	.73295
20	.93261	.90367	.87702	.85236	.82946	.80812	.78817	.76946
21	.98474	.95288	.92366	.89674	.87182	.84867	.82708	.80688
22	1.03969	1.00447	.97235	.94289	.91572	.89057	.86718	.84535
23	1.09800	1.05890	1.02345	.99110	.96141	.93402	.90864	.88503
24	1.16039	1.11670	1.07739	1.04174	1.00918	.97927	.95167	.92609

M \ N	33	34	35	36	37	38	39	40
25	1.22776	1.17859	1.13472	1.09522	1.05937	1.02662	.99652	.96873
26	1.30138	1.24547	1.19613	1.15210	1.11243	1.07640	1.04347	1.01320
27	1.38299	1.31858	1.26254	1.21307	1.16889	1.12906	1.09287	1.05977
28	1.47518	1.39969	1.33519	1.27903	1.22943	1.18511	1.14514	1.10880
29	1.58203	1.49136	1.41581	1.35123	1.29498	1.24526	1.20082	1.16071
30	1.71051	1.59766	1.50699	1.43140	1.36675	1.31041	1.26059	1.21603
31	1.87428	1.72556	1.61277	1.52210	1.44648	1.38177	1.32535	1.27544
32	2.10633	1.88867	1.74011	1.62739	1.53674	1.46109	1.39633	1.33984

M \ N	33	34	35	36	37	38	39	40
33	2.53153	2.11994	1.90260	1.75420	1.64156	1.55093	1.47526	1.41046
34		2.54400	2.13311	1.91609	1.76786	1.65529	1.56468	1.48901
35			2.55609	2.14588	1.92917	1.78110	1.66861	1.57804
36				2.56781	2.15826	1.94186	1.79395	1.68155
37					2.57918	2.17028	1.95418	1.80644
38						2.59023	2.18196	1.96616
39							2.60098	2.19332
40								2.61143

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=2.0

M \ N	1	2	3	4	5	6	7	8
1	.88623	.62666	.51166	.44311	.39633	.36180	.33496	.31333
2		1.14580	.85664	.71731	.63024	.56899	.52283	.48640
3			1.29037	.99598	.84793	.75272	.68440	.63213
4				1.38851	1.09467	.94313	.84382	.77152
5					1.46196	1.17045	1.01762	.91612
6						1.52027	1.23158	1.07852
7							1.56838	1.28260
8								1.60921

M \ N	9	10	11	12	13	14	15	16
1	.29541	.28025	.26721	.25583	.24580	.23685	.22882	.22156
2	.45669	.43184	.41067	.39234	.37627	.36203	.34929	.33781
3	.59040	.55605	.52712	.50232	.48073	.46172	.44481	.42964
4	.71559	.67054	.63319	.60154	.57427	.55043	.52936	.51056
5	.84144	.78316	.73590	.69648	.66291	.63386	.60837	.58577
6	.97586	.89971	.83989	.79108	.75018	.71521	.68483	.65809
7	1.12985	1.02663	.94957	.88869	.83880	.79681	.76078	.72939
8	1.32624	1.17408	1.07066	.99305	.93146	.88078	.83799	.80115

M \ N	9	10	11	12	13	14	15	16
9	1.64458	1.36428	1.21286	1.10947	1.03154	.96947	.91822	.87482
10		1.67572	1.39792	1.24733	1.14410	1.06603	1.00364	.95198
11			1.70350	1.42804	1.27830	1.17533	1.09722	1.03464
12				1.72855	1.45527	1.30638	1.20373	1.12567
13					1.75132	1.48009	1.33204	1.22975
14						1.77218	1.50286	1.35564
15							1.79142	1.52389
16								1.80926

M \ N	17	18	19	20	21	22	23	24
1	.21494	.20889	.20331	.19817	.19339	.18894	.18479	.18090
2	.32740	.31789	.30917	.30113	.29368	.28676	.28031	.27428
3	.41593	.40345	.39204	.38155	.37185	.36286	.35450	.34669
4	.49364	.47830	.46432	.45151	.43970	.42878	.41863	.40918
5	.56555	.54730	.53073	.51559	.50168	.48885	.47696	.46591
6	.63432	.61299	.59370	.57615	.56009	.54531	.53165	.51898
7	.70168	.67698	.65477	.63466	.61631	.59950	.58400	.56967
8	.76896	.74049	.71506	.69214	.67134	.65235	.63491	.61882

M \ N	17	18	19	20	21	22	23	24
9	.83736	.80455	.77547	.74943	.72594	.70458	.68504	.66709
10	.90812	.87017	.83687	.80729	.78077	.75679	.73496	.71497
11	.98268	.93847	.90015	.86645	.83646	.80954	.78516	.76294
12	1.06297	1.01082	.96634	.92772	.89370	.86339	.83613	.81142
13	1.15180	1.08905	1.03676	.99209	.95324	.91896	.88838	.86084
14	1.25374	1.17593	1.11319	1.06081	1.01600	.97697	.94249	.91168
15	1.37748	1.27597	1.19834	1.13564	1.08322	1.03831	.99913	.96449
16	1.54341	1.39778	1.29668	1.21924	1.15661	1.10417	1.05920	1.01992

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=2.0

M \ N	17	18	19	20	21	22	23	24
17	1.82587	1.56162	1.41674	1.31604	1.23881	1.17627	1.12385	1.07884
18		1.84141	1.57866	1.43451	1.33421	1.25720	1.19477	1.14239
19			1.85601	1.59468	1.45123	1.35132	1.27454	1.21224
20				1.86977	1.60978	1.46700	1.36749	1.29094
21					1.88277	1.62406	1.48193	1.38280
22						1.89508	1.63759	1.49609
23							1.90679	1.65046
24								1.91793

M \ N	25	26	27	28	29	30	31	32
1	.17725	.17380	.17055	.16748	.16457	.16180	.15917	.15666
2	.26862	.26330	.25828	.25353	.24904	.24478	.24074	.23688
3	.33937	.33250	.32603	.31993	.31415	.30868	.30348	.29854
4	.40034	.39205	.38426	.37691	.36997	.36340	.35717	.35125
5	.45559	.44593	.43686	.42833	.42028	.41267	.40546	.39861
6	.50718	.49615	.48582	.47612	.46697	.45834	.45016	.44242
7	.55635	.54393	.53231	.52142	.51117	.50151	.49238	.48374
8	.60392	.59005	.57711	.56500	.55362	.54292	.53281	.52326

M \ N	25	26	27	28	29	30	31	32
9	.65050	.63511	.62078	.60740	.59486	.58307	.57196	.56148
10	.69658	.67956	.66376	.64904	.63527	.62236	.61021	.59876
11	.74257	.72380	.70642	.69027	.67520	.66110	.64786	.63540
12	.78887	.76817	.74908	.73138	.71492	.69956	.68516	.67164
13	.83585	.81302	.79204	.77267	.75470	.73798	.72235	.70770
14	.88391	.85868	.83561	.81439	.79478	.77658	.75962	.74376
15	.93350	.90554	.88011	.85683	.83540	.81558	.79717	.78001
16	.98514	.95401	.92588	.90028	.87683	.85522	.83522	.81663

M \ N	25	26	27	28	29	30	31	32
17	1.03948	1.00460	.97335	.94508	.91934	.89573	.87397	.85381
18	1.09735	1.05795	1.02299	.99163	.96326	.93739	.91365	.89176
19	1.15990	1.11487	1.07543	1.04041	1.00897	.98051	.95453	.93068
20	1.22876	1.17649	1.13148	1.09202	1.05695	1.02546	.99691	.97085
21	1.30648	1.24444	1.19225	1.14726	1.10779	1.07270	1.04116	1.01255
22	1.39733	1.32125	1.25936	1.20724	1.16229	1.12283	1.08772	1.05614
23	1.50956	1.41117	1.33531	1.27357	1.22154	1.17664	1.13720	1.10208
24	1.66271	1.52239	1.42436	1.34874	1.28714	1.23521	1.19036	1.15094

M \ N	25	26	27	28	29	30	31	32
25	1.92857	1.67440	1.53465	1.43696	1.36157	1.30013	1.24829	1.20350
26		1.93873	1.68558	1.54637	1.44902	1.37386	1.31257	1.26083
27			1.94847	1.69629	1.55760	1.46059	1.38564	1.32451
28				1.95781	1.70657	1.56838	1.47169	1.39697
29					1.96678	1.71644	1.57874	1.48236
30						1.97542	1.72593	1.58871
31							1.98373	1.73508
32								1.99175

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=2.0

M \ N	33	34	35	36	37	38	39	40
1	.15427	.15199	.14980	.14770	.14569	.14376	.14191	.14012
2	.23321	.22970	.22634	.22313	.22005	.21710	.21426	.21153
3	.29384	.28934	.28505	.28095	.27701	.27324	.26962	.26614
4	.34562	.34025	.33512	.33022	.32552	.32103	.31671	.31256
5	.39210	.38590	.37999	.37434	.36894	.36376	.35880	.35403
6	.43506	.42806	.42138	.41501	.40892	.40310	.39751	.39216
7	.47553	.46773	.46031	.45323	.44647	.44000	.43381	.42787
8	.51420	.50561	.49743	.48964	.48221	.47511	.46831	.46180

M \ N	33	34	35	36	37	38	39	40
9	.55155	.54214	.53320	.52470	.51658	.50884	.50144	.49435
10	.58794	.57770	.56797	.55873	.54993	.54153	.53352	.52585
11	.62365	.61253	.60200	.59200	.58249	.57343	.56478	.55652
12	.65891	.64689	.63551	.62473	.61448	.60473	.59544	.58657
13	.69393	.68095	.66869	.65708	.64607	.63561	.62564	.61614
14	.72888	.71489	.70170	.68923	.67741	.66620	.65554	.64538
15	.76394	.74887	.73468	.72129	.70863	.69663	.68524	.67440
16	.79928	.78304	.76779	.75342	.73986	.72703	.71487	.70331

M \ N	33	34	35	36	37	38	39	40
17	.83506	.81755	.80115	.78574	.77122	.75751	.74452	.73220
18	.87146	.85257	.83492	.81838	.80282	.78816	.77431	.76119
19	.90867	.88825	.86924	.85146	.83479	.81911	.80433	.79035
20	.94690	.92479	.90427	.88514	.86725	.85047	.83468	.81978
21	.98641	.96239	.94018	.91956	.90034	.88236	.86547	.84958
22	1.02748	1.00128	.97719	.95491	.93421	.91490	.89683	.87986
23	1.07047	1.04177	1.01552	.99137	.96902	.94825	.92887	.91072
24	1.11582	1.08420	1.05547	1.02918	1.00497	.98257	.96173	.94229

M \ N	33	34	35	36	37	38	39	40
25	1.16411	1.12900	1.09736	1.06861	1.04229	1.01804	.99559	.97470
26	1.21611	1.17675	1.14165	1.11002	1.08125	1.05490	1.03061	1.00812
27	1.27287	1.22621	1.18890	1.15382	1.12219	1.09341	1.06704	1.04273
28	1.33598	1.28445	1.23986	1.20059	1.16554	1.13391	1.10513	1.07874
29	1.40786	1.34702	1.29560	1.25108	1.21186	1.17683	1.14522	1.11644
30	1.49264	1.41835	1.35766	1.30635	1.26190	1.22273	1.18774	1.15614
31	1.59832	1.50255	1.42846	1.36792	1.31672	1.27235	1.23323	1.19827
32	1.74391	1.60759	1.51211	1.43822	1.37783	1.32673	1.28244	1.24338

M \ N	33	34	35	36	37	38	39	40
33	1.99950	1.75243	1.61654	1.52134	1.44766	1.38742	1.33642	1.29221
34		2.00699	1.76066	1.62519	1.53027	1.45679	1.39669	1.34580
35			2.01423	1.76863	1.63356	1.53892	1.46563	1.40567
36				2.02125	1.77635	1.64168	1.54730	1.47419
37					2.02805	1.78383	1.64954	1.55542
38						2.03465	1.79109	1.65717
39							2.04106	1.79814
40								2.04729

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=2.5

M \ N	1	2	3	4	5	6	7	8
1	.88726	.67242	.57175	.50960	.46608	.43330	.40739	.38620
2		1.10211	.87377	.75819	.68366	.62999	.58877	.55572
3			1.21628	.98934	.86999	.79099	.73305	.68792
4				1.29192	1.06890	.94899	.86826	.80826
5					1.34768	1.12886	1.00955	.92825
6						1.39144	1.17658	1.05832
7							1.42726	1.21600
8								1.45744

M \ N	9	10	11	12	13	14	15	16
1	.36843	.35323	.34001	.32838	.31804	.30875	.30034	.29269
2	.52839	.50527	.48536	.46795	.45255	.43880	.42640	.41516
3	.65135	.62087	.59489	.57239	.55263	.53508	.51935	.50513
4	.76105	.72249	.69012	.66240	.63826	.61698	.59802	.58096
5	.86726	.81890	.77913	.74558	.71670	.69146	.66914	.64918
6	.97705	.91562	.86662	.82611	.79178	.76212	.73612	.71304
7	1.09896	1.01800	.95646	.90712	.86617	.83132	.80113	.77458
8	1.24944	1.13366	1.05317	.99170	.94223	.90101	.86584	.83527

M \ N	9	10	11	12	13	14	15	16
9	1.48343	1.27838	1.16384	1.08390	1.02263	.97314	.93179	.89641
10		1.50622	1.30384	1.19049	1.11113	1.05012	1.00070	.95931
11			1.52646	1.32651	1.21430	1.13553	1.07483	1.02554
12				1.54463	1.34691	1.23578	1.15761	1.09723
13					1.56111	1.36543	1.25532	1.17774
14						1.57616	1.38237	1.27323
15							1.59001	1.39796
16								1.60281

M \ N	17	18	19	20	21	22	23	24
1	.28568	.27922	.27324	.26770	.26252	.25768	.25314	.24887
2	.40488	.39545	.38675	.37868	.37117	.36416	.35759	.35142
3	.49219	.48035	.46944	.45936	.45001	.44128	.43313	.42547
4	.56551	.55142	.53849	.52656	.51552	.50525	.49566	.48669
5	.63119	.61484	.59991	.58618	.57350	.56173	.55078	.54054
6	.69236	.67368	.65667	.64110	.62676	.61349	.60117	.58968
7	.75095	.72974	.71053	.69301	.67694	.66213	.64840	.63564
8	.80832	.78429	.76267	.74306	.72514	.70869	.69350	.67940

M \ N	17	18	19	20	21	22	23	24
9	.86558	.83835	.81403	.79209	.77217	.75394	.73718	.72168
10	.92381	.89281	.86538	.84083	.81866	.79849	.78002	.76301
11	.98416	.94860	.91750	.88993	.86521	.84287	.82251	.80384
12	1.04811	1.00679	.97122	.94006	.91239	.88756	.86508	.84457
13	1.11770	1.06877	1.02754	.99200	.96081	.93308	.90817	.88559
14	1.19621	1.13652	1.08780	1.04669	1.01119	.98000	.95225	.92728
15	1.28973	1.21326	1.15392	1.10541	1.06443	1.02901	.99765	.97008
16	1.41239	1.30503	1.22909	1.17009	1.12181	1.08097	1.04562	1.01451

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=2.5

M \ N	17	18	19	20	21	22	23	24
17	1.61471	1.42581	1.31926	1.24384	1.18518	1.13712	1.09643	1.06118
18		1.62582	1.43834	1.33257	1.25764	1.19931	1.15148	1.11095
19			1.63624	1.45010	1.34506	1.27060	1.21260	1.16499
20				1.64603	1.46115	1.35682	1.28282	1.22512
21					1.65528	1.47159	1.36792	1.29435
22						1.66403	1.48146	1.37843
23							1.67232	1.49083
24								1.68022

M \ N	25	26	27	28	29	30	31	32
1	.24484	.24103	.23741	.23399	.23072	.22762	.22465	.22182
2	.34560	.34011	.33492	.32999	.32531	.32085	.31659	.31253
3	.41828	.41149	.40507	.39899	.39322	.38773	.38250	.37751
4	.47826	.47032	.46283	.45574	.44901	.44262	.43654	.43074
5	.53094	.52192	.51341	.50537	.49776	.49054	.48367	.47712
6	.57893	.56884	.55935	.55039	.54192	.53388	.52626	.51900
7	.62372	.61256	.60208	.59220	.58287	.57404	.56567	.55771
8	.66628	.65402	.64252	.63171	.62152	.61188	.60276	.59409

M \ N	25	26	27	28	29	30	31	32
9	.70729	.69387	.68132	.66955	.65847	.64801	.63812	.62874
10	.74726	.73263	.71997	.70619	.69418	.68287	.67219	.66208
11	.78663	.77068	.75584	.74199	.72900	.71680	.70529	.69443
12	.82574	.80837	.79226	.77726	.76323	.75008	.73771	.72605
13	.86496	.84601	.82851	.81226	.79712	.78296	.76967	.75716
14	.90462	.88391	.86487	.84726	.83090	.81564	.80136	.78795
15	.94508	.92237	.90160	.88248	.86478	.84833	.83298	.81860
16	.98675	.96174	.93899	.91817	.89899	.88123	.86471	.84928

M \ N	25	26	27	28	29	30	31	32
17	1.03012	1.00239	.97737	.95461	.93376	.91453	.89672	.88014
18	1.07580	1.04480	1.01710	.99210	.96933	.94846	.92920	.91135
19	1.12462	1.08958	1.05865	1.03099	1.00601	.98325	.96236	.94309
20	1.17774	1.13753	1.10260	1.07175	1.04414	1.01919	.99644	.97555
21	1.23697	1.18981	1.14975	1.11494	1.08417	1.05662	1.03170	1.00897
22	1.30529	1.24820	1.20125	1.16135	1.12666	1.09598	1.06849	1.04361
23	1.38840	1.31567	1.25887	1.21213	1.17239	1.13782	1.10722	1.07980
24	1.49973	1.39789	1.32554	1.26902	1.22250	1.18292	1.14846	1.11795

M \ N	25	26	27	28	29	30	31	32
25	1.68774	1.50822	1.40693	1.33496	1.27872	1.23240	1.19297	1.15863
26		1.69492	1.51632	1.41557	1.34396	1.28798	1.24186	1.20258
27			1.70179	1.52407	1.42383	1.35258	1.29685	1.25092
28				1.70837	1.53150	1.43175	1.36083	1.30535
29					1.71468	1.53862	1.43935	1.36876
30						1.72075	1.54547	1.44665
31							1.72660	1.55206
32								1.73223

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=2.5

M \ N	33	34	35	36	37	38	39	40
1	.21910	.21650	.21401	.21161	.20930	.20708	.20494	.20288
2	.30865	.30493	.30136	.29793	.29464	.29147	.28842	.28547
3	.37274	.36818	.36380	.35960	.35557	.35169	.34795	.34436
4	.42521	.41991	.41484	.40998	.40531	.40083	.39651	.39235
5	.47088	.46492	.45921	.45374	.44849	.44345	.43860	.43394
6	.51208	.50548	.49916	.49312	.48732	.48176	.47641	.47127
7	.55013	.54290	.53600	.52939	.52306	.51699	.51117	.50556
8	.58586	.57801	.57052	.56336	.55651	.54994	.54364	.53758

M \ N	33	34	35	36	37	38	39	40
9	.61984	.61136	.60328	.59557	.58820	.58113	.57436	.56786
10	.65249	.64338	.63470	.62642	.61852	.61095	.60371	.59676
11	.68413	.67436	.66507	.65622	.64777	.63970	.63197	.62456
12	.71501	.70456	.69463	.68519	.67618	.66759	.65937	.65150
13	.74535	.73418	.72359	.71352	.70394	.69481	.68608	.67773
14	.77532	.76339	.75210	.74139	.73121	.72151	.71226	.70342
15	.80509	.79236	.78033	.76894	.75812	.74784	.73803	.72868
16	.83482	.82122	.80840	.79628	.78480	.77389	.76352	.75363

M \ N	33	34	35	36	37	38	39	40
17	.86464	.85011	.83645	.82355	.81136	.79979	.78881	.77835
18	.89472	.87917	.86459	.85086	.83790	.82564	.81401	.80296
19	.92520	.90854	.89295	.87832	.86454	.85152	.83920	.82752
20	.95626	.93836	.92167	.90604	.89137	.87755	.86449	.85212
21	.98809	.96880	.95088	.93417	.91852	.90381	.88995	.87686
22	1.02090	1.00003	.98074	.96282	.94609	.93042	.91569	.90180
23	1.05496	1.03228	1.01143	.99215	.97422	.95749	.94180	.92705
24	1.09059	1.06581	1.04316	1.02233	1.00306	.98514	.96840	.95270

M \ N	33	34	35	36	37	38	39	40
25	1.12821	1.10092	1.07619	1.05358	1.03277	1.01351	.99560	.97886
26	1.16836	1.13804	1.11082	1.08613	1.06357	1.04279	1.02355	1.00564
27	1.21180	1.17769	1.14746	1.12031	1.09568	1.07315	1.05241	1.03319
28	1.25962	1.22064	1.18665	1.15651	1.12943	1.10486	1.08238	1.06166
29	1.31352	1.26797	1.22914	1.19526	1.16521	1.13821	1.11369	1.09125
30	1.37638	1.32138	1.27601	1.23731	1.20355	1.17359	1.14666	1.12220
31	1.45368	1.38371	1.32894	1.28374	1.24519	1.21154	1.18167	1.15481
32	1.55840	1.46045	1.39078	1.33623	1.29121	1.25279	1.21925	1.18947

M \ N	33	34	35	36	37	38	39	40
33	1.73766	1.56453	1.46698	1.39760	1.34326	1.29841	1.26013	1.22669
34		1.74291	1.57044	1.47329	1.40418	1.35006	1.30537	1.26722
35			1.74798	1.57615	1.47939	1.41055	1.35663	1.31210
36				1.75289	1.58168	1.48529	1.41671	1.36299
37					1.75764	1.58704	1.49100	1.42268
38						1.76226	1.59223	1.49654
39							1.76673	1.59726
40								1.77107

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=3.0

M \ N	1	2	3	4	5	6	7	8
1	.89298	.70876	.61916	.56254	.52222	.49143	.46681	.44649
2		1.07720	.88796	.78900	.72384	.67618	.63911	.60907
3			1.17182	.98692	.88675	.81916	.76886	.72922
4				1.23346	1.05369	.95434	.88623	.83492
5					1.27840	1.10337	1.00542	.93755
6						1.31340	1.14254	1.04615
7							1.34188	1.17467
8								1.36577

M \ N	9	10	11	12	13	14	15	16
1	.42930	.41448	.40152	.39004	.37978	.37051	.36209	.35438
2	.58401	.56264	.54410	.52779	.51327	.50024	.48844	.47768
3	.69678	.66949	.64608	.62565	.60760	.59148	.57695	.56376
4	.79410	.76043	.73194	.70736	.68582	.66671	.64959	.63412
5	.88595	.84460	.81029	.78111	.75582	.73358	.71379	.69601
6	.97882	.92730	.88577	.85115	.82157	.79585	.77316	.75292
7	1.07982	1.01317	.96190	.92039	.88565	.85587	.82989	.80691
8	1.20178	1.10838	1.04247	.99155	.95018	.91543	.88556	.85943

M \ N	9	10	11	12	13	14	15	16
9	1.38626	1.22513	1.13310	1.06792	1.01741	.97624	.94156	.91168
10		1.40417	1.24558	1.15482	1.09037	1.04029	.99936	.96480
11			1.42003	1.26373	1.17415	1.11041	1.06076	1.02009
12				1.43424	1.28001	1.19154	1.12846	1.07924
13					1.44709	1.29476	1.20731	1.14487
14						1.45881	1.30821	1.22172
15							1.46956	1.32057
16								1.47950

M \ N	17	18	19	20	21	22	23	24
1	.34729	.34074	.33465	.32898	.32367	.31869	.31400	.30958
2	.46781	.45871	.45028	.44244	.43512	.42826	.42181	.41573
3	.55170	.54061	.53037	.52086	.51200	.50372	.49595	.48864
4	.62003	.60713	.59524	.58424	.57401	.56446	.55553	.54713
5	.67990	.66520	.65170	.63925	.62771	.61696	.60692	.59750
6	.73468	.71812	.70298	.68906	.67619	.66425	.65311	.64270
7	.78635	.76780	.75092	.73546	.72123	.70805	.69580	.68437
8	.83627	.81551	.79673	.77963	.76393	.74946	.73605	.72356

M \ N	17	18	19	20	21	22	23	24
9	.88549	.86222	.84133	.82240	.80512	.78926	.77461	.76102
10	.93497	.90876	.88544	.86446	.84543	.82804	.81205	.79726
11	.98569	.95593	.92975	.90641	.88539	.86630	.84883	.83275
12	1.03885	1.00463	.97497	.94884	.92552	.90449	.88536	.86784
13	1.09607	1.05596	1.02193	.99239	.96634	.94305	.92202	.90288
14	1.15989	1.11149	1.07167	1.03783	1.00843	.98246	.95922	.93822
15	1.23496	1.17371	1.12572	1.08617	1.05253	1.02327	.99739	.97422
16	1.33198	1.24721	1.18651	1.13890	1.09963	1.06619	1.03707	1.01130

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=3.0

M \ N	17	18	19	20	21	22	23	24
17	1.48872	1.34258	1.25860	1.19842	1.15117	1.11217	1.07893	1.04996
18		1.49731	1.35246	1.26922	1.20953	1.16264	1.12390	1.09086
19			1.50536	1.36171	1.27916	1.21995	1.17340	1.13492
20				1.51292	1.37040	1.28851	1.22975	1.18353
21					1.52005	1.37859	1.29733	1.23900
22						1.52678	1.38633	1.30566
23							1.53317	1.39366
24								1.53923

M \ N	25	26	27	28	29	30	31	32
1	.30539	.30143	.29766	.29407	.29065	.28739	.28426	.28127
2	.40999	.40456	.39940	.39450	.38983	.38537	.38111	.37703
3	.48174	.47521	.46903	.46316	.45757	.45224	.44715	.44228
4	.53922	.53175	.52468	.51798	.51160	.50553	.49973	.49420
5	.58865	.58030	.57241	.56493	.55783	.55107	.54464	.53849
6	.63292	.62371	.61503	.60681	.59901	.59161	.58455	.57783
7	.67366	.66360	.65412	.64517	.63669	.62864	.62099	.61370
8	.71190	.70097	.69068	.68098	.67182	.66313	.65487	.64702

M \ N	25	26	27	28	29	30	31	32
9	.74835	.73650	.72539	.71493	.70505	.69571	.68685	.67843
10	.78353	.77073	.75874	.74748	.73687	.72685	.71737	.70837
11	.81786	.80402	.79111	.77900	.76763	.75691	.74677	.73717
12	.85169	.83673	.82281	.80981	.79762	.78615	.77533	.76510
13	.88533	.86914	.85413	.84015	.82708	.81482	.80328	.79238
14	.91908	.90152	.88530	.87026	.85624	.84312	.83080	.81920
15	.95326	.93414	.91657	.90035	.88528	.87123	.85808	.84572
16	.98820	.96728	.94819	.93064	.91441	.89933	.88526	.87208

M \ N	25	26	27	28	29	30	31	32
17	1.02429	1.00127	.98041	.96135	.94382	.92760	.91252	.89845
18	1.06203	1.03648	1.01354	.99274	.97372	.95622	.94002	.92495
19	1.10206	1.07339	1.04795	1.02510	1.00436	.98539	.96792	.95174
20	1.14529	1.11263	1.08410	1.05878	1.03601	1.01534	.99642	.97899
21	1.19309	1.15509	1.12261	1.09423	1.06902	1.04634	1.02575	1.00688
22	1.24774	1.20214	1.16437	1.13207	1.10384	1.07874	1.05615	1.03563
23	1.31356	1.25603	1.21072	1.17318	1.14106	1.11296	1.08798	1.06548
24	1.40063	1.32106	1.26391	1.21888	1.18156	1.14961	1.12165	1.09678

M \ N	25	26	27	28	29	30	31	32
25	1.54501	1.40726	1.32820	1.27142	1.22666	1.18955	1.15777	1.12994
26		1.55052	1.41358	1.33502	1.27858	1.23408	1.19717	1.16556
27			1.55578	1.41963	1.34153	1.28542	1.24118	1.20447
28				1.56083	1.42541	1.34777	1.29198	1.24798
29					1.56566	1.43096	1.35374	1.29826
30						1.57031	1.43628	1.35948
31							1.57478	1.44140
32								1.57908

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=3.0

M \ N	33	34	35	36	37	38	39	40
1	.27840	.27564	.27299	.27044	.26798	.26561	.26332	.26111
2	.37312	.36937	.36576	.36230	.35896	.35573	.35263	.34962
3	.43762	.43315	.42886	.42473	.42075	.41692	.41323	.40967
4	.48890	.48382	.47895	.47426	.46976	.46542	.46124	.45721
5	.53261	.52698	.52159	.51641	.51142	.50663	.50201	.49756
6	.57140	.56526	.55937	.55372	.54829	.54307	.53804	.53319
7	.60674	.60009	.59372	.58762	.58176	.57613	.57071	.56550
8	.63954	.63239	.62555	.61901	.61273	.60670	.60090	.59532

M \ N	33	34	35	36	37	38	39	40
9	.67041	.66277	.65546	.64847	.64177	.63534	.62917	.62323
10	.69981	.69165	.68387	.67643	.66931	.66249	.65593	.64963
11	.72805	.71938	.71111	.70321	.69566	.68843	.68149	.67483
12	.75540	.74619	.73742	.72905	.72106	.71341	.70609	.69906
13	.78207	.77230	.76300	.75415	.74570	.73763	.72990	.72249
14	.80825	.79787	.78803	.77866	.76974	.76123	.75308	.74529
15	.83407	.82306	.81264	.80274	.79332	.78434	.77577	.76756
16	.85969	.84801	.83697	.82650	.81655	.80709	.79806	.78944

M \ N	33	34	35	36	37	38	39	40
17	.88525	.87284	.86113	.85005	.83955	.82957	.82006	.81100
18	.91087	.89766	.88523	.87351	.86241	.85188	.84187	.83233
19	.93668	.92261	.90940	.89696	.88522	.87410	.86356	.85352
20	.96284	.94780	.93373	.92052	.90808	.89634	.88521	.87464
21	.98949	.97337	.95835	.94429	.93109	.91866	.90691	.89577
22	1.01682	.99947	.98338	.96839	.95435	.94116	.92873	.91698
23	1.04503	1.02628	1.00898	.99293	.97796	.96394	.95077	.93835
24	1.07438	1.05400	1.03531	1.01806	1.00204	.98710	.97311	.95995

M \ N	33	34	35	36	37	38	39	40
25	1.10518	1.08287	1.06256	1.04393	1.02673	1.01076	.99585	.98188
26	1.13787	1.11321	1.09099	1.07076	1.05219	1.03504	1.01910	1.00423
27	1.17301	1.14545	1.12091	1.09877	1.07861	1.06011	1.04301	1.02711
28	1.21146	1.18016	1.15272	1.12828	1.10624	1.08615	1.06771	1.05066
29	1.25450	1.21817	1.18702	1.15971	1.13537	1.11341	1.09340	1.07502
30	1.30430	1.26076	1.22461	1.19361	1.16642	1.14219	1.12031	1.10037
31	1.36500	1.31010	1.26679	1.23081	1.19995	1.17288	1.14875	1.12696
32	1.44633	1.37031	1.31569	1.27259	1.23679	1.20607	1.17911	1.15507

M \ N	33	34	35	36	37	38	39	40
33	1.58323	1.45108	1.37544	1.32108	1.27818	1.24255	1.21196	1.18512
34		1.58723	1.45567	1.38038	1.32628	1.28358	1.24811	1.21766
35			1.59110	1.46010	1.38515	1.33130	1.28880	1.25348
36				1.59484	1.46438	1.38977	1.33616	1.29385
37					1.59847	1.46852	1.39423	1.34086
38						1.60198	1.47254	1.39856
39							1.60539	1.47643
40								1.60869

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=3.5

M \ N	1	2	3	4	5	6	7	8
1	.89975	.73809	.65736	.60548	.56809	.53925	.51602	.49670
2		1.06140	.89957	.81297	.75508	.71226	.67866	.65123
3			1.14231	.98618	.89980	.84071	.79627	.76095
4				1.19436	1.04377	.95889	.89996	.85512
5					1.23201	1.08620	1.00309	.94479
6						1.26117	1.11945	1.03807
7							1.28479	1.14657
8								1.30453

M \ N	9	10	11	12	13	14	15	16
1	.48026	.46602	.45350	.44237	.43237	.42331	.41504	.40746
2	.62820	.60844	.59121	.57599	.56239	.55013	.53898	.52879
3	.73185	.70722	.68596	.66733	.65080	.63597	.62255	.61033
4	.81917	.78931	.76390	.74186	.72245	.70517	.68962	.67552
5	.90007	.86395	.83379	.80799	.78552	.76566	.74793	.73193
6	.98058	.93618	.90014	.86991	.84394	.82125	.80114	.78313
7	1.06682	1.01017	.96622	.93038	.90020	.87420	.85141	.83116
8	1.16935	1.09110	1.03529	.99182	.95625	.92620	.90024	.87744

M \ N	9	10	11	12	13	14	15	16
9	1.32143	1.18892	1.11203	1.05702	1.01405	.97878	.94892	.92305
10		1.33615	1.20600	1.13037	1.07612	1.03364	.99869	.96903
11			1.34917	1.22113	1.14664	1.09312	1.05111	1.01649
12				1.36081	1.23467	1.16124	1.10839	1.06685
13					1.37132	1.24691	1.17445	1.12224
14						1.38089	1.25805	1.18650
15							1.38967	1.26828
16								1.39776

M \ N	17	18	19	20	21	22	23	24
1	.40046	.39398	.38794	.38229	.37700	.37202	.36733	.36289
2	.51941	.51074	.50268	.49517	.48814	.48153	.47531	.46944
3	.59913	.58879	.57922	.57031	.56198	.55418	.54684	.53993
4	.66263	.65080	.63986	.62971	.62025	.61140	.60309	.59527
5	.71738	.70407	.69181	.68046	.66992	.66007	.65085	.64219
6	.76684	.75200	.73839	.72584	.71421	.70338	.69327	.68378
7	.81298	.79651	.78148	.76768	.75492	.74309	.73205	.72173
8	.85713	.83886	.82228	.80713	.79318	.78029	.76830	.75712

M \ N	17	18	19	20	21	22	23	24
9	.90028	.87997	.86166	.84502	.82978	.81575	.80276	.79067
10	.94330	.92059	.90031	.88200	.86533	.85005	.83597	.82290
11	.98705	.96146	.93885	.91862	.90033	.88367	.86837	.85425
12	1.03255	1.00333	.97790	.95540	.93524	.91700	.90035	.88506
13	1.08114	1.04716	1.01817	.99290	.97052	.95044	.93226	.91564
14	1.13489	1.09421	1.06053	1.03178	1.00668	.98442	.96443	.94631
15	1.19756	1.14651	1.10623	1.07286	1.04432	1.01940	.99727	.97738
16	1.27770	1.20777	1.15726	1.11736	1.08427	1.05596	1.03120	1.00920

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=3.5

M \ N	17	18	19	20	21	22	23	24
17	1.40526	1.28644	1.21724	1.16723	1.12770	1.09489	1.06679	1.04220
18		1.41225	1.29459	1.22607	1.17653	1.13735	1.10481	1.07692
19			1.41879	1.30220	1.23433	1.18524	1.14639	1.11410
20				1.42492	1.30934	1.24208	1.19341	1.15489
21					1.43070	1.31607	1.24938	1.20112
22						1.43616	1.32242	1.25627
23							1.44133	1.32843
24								1.44624

M \ N	25	26	27	28	29	30	31	32
1	.35868	.35468	.35088	.34725	.34379	.34048	.33730	.33425
2	.46388	.45860	.45359	.44881	.44425	.43989	.43572	.43172
3	.53339	.52719	.52130	.51570	.51036	.50526	.50039	.49571
4	.58789	.58090	.57427	.56796	.56198	.55625	.55078	.54555
5	.63403	.62631	.61900	.61206	.60546	.59917	.59317	.58743
6	.67485	.66643	.65847	.65092	.64374	.63691	.63040	.62418
7	.71204	.70292	.69430	.68615	.67841	.67106	.66405	.65736
8	.74665	.73681	.72753	.71877	.71047	.70258	.69508	.68793

M \ N	25	26	27	28	29	30	31	32
9	.77937	.76879	.75883	.74944	.74056	.73214	.72414	.71653
10	.81074	.79937	.78870	.77866	.76918	.76021	.75170	.74361
11	.84115	.82894	.81751	.80678	.79667	.78712	.77808	.76950
12	.87093	.85780	.84556	.83409	.82332	.81316	.80356	.79446
13	.90037	.88624	.87311	.86085	.84936	.83855	.82836	.81872
14	.92974	.91450	.90038	.88725	.87499	.86348	.85266	.84245
15	.95933	.94281	.92750	.91351	.90040	.88813	.87663	.86579
16	.98941	.97144	.95498	.93981	.92575	.91266	.90041	.88890

M \ N	25	26	27	28	29	30	31	32
17	1.02033	1.00065	.98275	.96636	.95124	.93721	.92414	.91191
18	1.05249	1.03075	1.01117	.99336	.97703	.96196	.94798	.93494
19	1.08641	1.06215	1.04054	1.02107	1.00334	.98708	.97206	.95812
20	1.12285	1.09535	1.07125	1.04977	1.03039	1.01275	.99656	.98160
21	1.16290	1.13110	1.10379	1.07984	1.05848	1.03922	1.02166	1.00554
22	1.20840	1.17047	1.13890	1.11178	1.08797	1.06674	1.04758	1.03010
23	1.26280	1.21529	1.17765	1.14629	1.11935	1.09569	1.07458	1.05552
24	1.33414	1.26900	1.22184	1.18446	1.15332	1.12655	1.10304	1.08204

M \ N	25	26	27	28	29	30	31	32
25	1.45091	1.33957	1.27489	1.22807	1.19095	1.16001	1.13341	1.11003
26		1.45537	1.34474	1.28051	1.23401	1.19714	1.16640	1.13996
27			1.45962	1.34969	1.28588	1.23968	1.20305	1.17250
28				1.46369	1.35441	1.29101	1.24511	1.20870
29					1.46759	1.35894	1.29593	1.25031
30						1.47134	1.36329	1.30065
31							1.47494	1.36746
32								1.47841

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=3.5

M \ N	33	34	35	36	37	38	39	40
1	.33133	.32851	.32581	.32319	.32067	.31824	.31589	.31361
2	.42788	.42419	.42064	.41722	.41392	.41073	.40766	.40468
3	.49123	.48693	.48279	.47880	.47496	.47125	.46767	.46421
4	.54053	.53572	.53109	.52663	.52235	.51821	.51422	.51036
5	.58193	.57665	.57159	.56672	.56203	.55751	.55315	.54894
6	.61823	.61252	.60705	.60179	.59673	.59185	.58715	.58262
7	.65097	.64485	.63898	.63335	.62793	.62272	.61770	.61285
8	.68111	.67458	.66832	.66232	.65656	.65102	.64568	.64053

M \ N	33	34	35	36	37	38	39	40
9	.70927	.70233	.69569	.68932	.68321	.67734	.67170	.66626
10	.73590	.72854	.72151	.71478	.70833	.70213	.69617	.69043
11	.76133	.75355	.74612	.73901	.73221	.72568	.71941	.71337
12	.78582	.77760	.76976	.76227	.75510	.74823	.74164	.73531
13	.80958	.80090	.79263	.78474	.77720	.76998	.76307	.75642
14	.83278	.82361	.81489	.80659	.79866	.79108	.78382	.77686
15	.85557	.84588	.83669	.82795	.81961	.81165	.80404	.79675
16	.87807	.86783	.85814	.84893	.84017	.83181	.82383	.81620

M \ N	33	34	35	36	37	38	39	40
17	.90042	.88959	.87935	.86965	.86043	.85165	.84329	.83529
18	.92272	.91125	.90042	.89019	.88049	.87127	.86249	.85411
19	.94511	.93293	.92147	.91066	.90043	.89073	.88151	.87273
20	.96771	.95474	.94258	.93114	.92035	.91013	.90044	.89122
21	.99064	.97679	.96385	.95173	.94031	.92954	.91934	.90966
22	1.01405	.99921	.98541	.97252	.96042	.94904	.93828	.92810
23	1.03813	1.02215	1.00737	.99361	.98076	.96870	.95734	.94662
24	1.06308	1.04577	1.02986	1.01514	1.00144	.98863	.97660	.96528

M \ N	33	34	35	36	37	38	39	40
25	1.08916	1.07029	1.05306	1.03722	1.02256	1.00891	.99614	.98415
26	1.11671	1.09595	1.07717	1.06003	1.04426	1.02966	1.01606	1.00334
27	1.14622	1.12310	1.10245	1.08377	1.06671	1.05100	1.03646	1.02291
28	1.17834	1.15221	1.12922	1.10868	1.09009	1.07310	1.05747	1.04298
29	1.21413	1.18394	1.15796	1.13509	1.11465	1.09615	1.07925	1.06368
30	1.25530	1.21933	1.18932	1.16348	1.14073	1.12039	1.10198	1.08515
31	1.30518	1.26010	1.22433	1.19449	1.16878	1.14616	1.12592	1.10759
32	1.37148	1.30954	1.26472	1.22914	1.19946	1.17389	1.15138	1.13124

M \ N	33	34	35	36	37	38	39	40
33	1.48175	1.37535	1.31375	1.26916	1.23378	1.20426	1.17882	1.15641
34		1.48498	1.37908	1.31780	1.27345	1.23826	1.20888	1.18357
35			1.48809	1.38269	1.32171	1.27759	1.24258	1.21335
36				1.49110	1.38617	1.32550	1.28159	1.24675
37					1.49402	1.38954	1.32915	1.28546
38						1.49684	1.39281	1.33270
39							1.49958	1.39597
40								1.50223

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=4.0

M \ N	1	2	3	4	5	6	7	8
1	.90640	.76219	.68872	.64092	.60615	.57914	.55725	.53895
2		1.05061	.90914	.83210	.78003	.74119	.71050	.68531
3			1.12135	.98618	.91021	.85770	.81790	.78608
4				1.16641	1.03683	.96272	.91076	.87094
5					1.19881	1.07388	1.00168	.95058
6						1.22379	1.10276	1.03235
7							1.24396	1.12623
8								1.26078

M \ N	9	10	11	12	13	14	15	16
1	.52331	.50971	.49771	.48700	.47735	.46859	.46057	.45320
2	.66406	.64575	.62972	.61551	.60278	.59126	.58077	.57115
3	.75971	.73729	.71787	.70078	.68556	.67187	.65946	.64812
4	.83882	.81201	.78909	.76913	.75150	.73575	.72153	.70861
5	.91109	.87903	.85212	.82901	.80880	.79089	.77484	.76032
6	.98216	.94316	.91132	.88448	.86134	.84104	.82300	.80678
7	1.05744	1.00817	.96969	.93816	.91148	.88840	.86811	.85002
8	1.14588	1.07856	1.03015	.99222	.96102	.93455	.91160	.89136

M \ N	9	10	11	12	13	14	15	16
9	1.27515	1.16271	1.09671	1.04912	1.01172	.98087	.95464	.93184
10		1.28764	1.17738	1.11258	1.06574	1.02885	.99836	.97237
11			1.29866	1.19034	1.12663	1.08050	1.04409	1.01395
12				1.30851	1.20193	1.13920	1.09374	1.05780
13					1.31739	1.21238	1.15057	1.10572
14						1.32547	1.22189	1.16092
15							1.33287	1.23060
16								1.33969

M \ N	17	18	19	20	21	22	23	24
1	.44638	.44005	.43414	.42861	.42342	.41852	.41389	.40951
2	.56227	.55405	.54640	.53924	.53254	.52623	.52027	.51464
3	.63769	.62806	.61911	.61077	.60296	.59563	.58873	.58220
4	.69677	.68586	.67577	.66638	.65761	.64939	.64167	.63438
5	.74708	.73493	.72372	.71333	.70365	.69459	.68609	.67810
6	.79208	.77866	.76632	.75491	.74431	.73443	.72518	.71649
7	.83373	.81894	.80540	.79293	.78140	.77067	.76065	.75125
8	.87329	.85698	.84214	.82855	.81601	.80439	.79357	.78346

M \ N	17	18	19	20	21	22	23	24
9	.91169	.89367	.87738	.86254	.84892	.83634	.82468	.81380
10	.94974	.92972	.91177	.89552	.88070	.86708	.85450	.84280
11	.98822	.96577	.94587	.92801	.91183	.89705	.88345	.87087
12	1.02799	1.00250	.98024	.96048	.94272	.92661	.91188	.89832
13	1.07022	1.04073	1.01549	.99341	.97379	.95615	.94012	.92545
14	1.11664	1.08155	1.05238	1.02738	1.00548	.98601	.96847	.95253
15	1.17041	1.12667	1.09197	1.06310	1.03833	1.01661	.99728	.97986
16	1.23863	1.17916	1.13592	1.10160	1.07301	1.04846	1.02692	1.00773

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=4.0

M \ N	17	18	19	20	21	22	23	24
17	1.34601	1.24606	1.18727	1.14450	1.11053	1.08222	1.05788	1.03652
18		1.35188	1.25298	1.19482	1.15249	1.11886	1.09081	1.06668
19			1.35738	1.25944	1.20187	1.15997	1.12665	1.09885
20				1.36253	1.26550	1.20849	1.16698	1.13397
21					1.36739	1.27120	1.21471	1.17358
22						1.37197	1.27658	1.22059
23							1.37630	1.28167
24								1.38042

M \ N	25	26	27	28	29	30	31	32
1	.40536	.40140	.39763	.39403	.39059	.38729	.38413	.38110
2	.50931	.50423	.49941	.49480	.49040	.48619	.48215	.47827
3	.57603	.57017	.56460	.55928	.55421	.54937	.54472	.54027
4	.62749	.62096	.61476	.60885	.60322	.59785	.59270	.58777
5	.67055	.66340	.65662	.65018	.64404	.63818	.63258	.62722
6	.70830	.70056	.69323	.68627	.67964	.67333	.66730	.66154
7	.74242	.73409	.72621	.71875	.71165	.70489	.69845	.69229
8	.77397	.76503	.75660	.74862	.74105	.73385	.72699	.72044

M \ N	25	26	27	28	29	30	31	32
9	.80362	.79406	.78506	.77655	.76850	.76085	.75357	.74663
10	.83189	.82168	.81207	.80302	.79446	.78634	.77864	.77130
11	.85917	.84824	.83800	.82837	.81928	.81069	.80253	.79478
12	.88575	.87406	.86314	.85289	.84324	.83413	.82551	.81733
13	.91192	.89939	.88772	.87680	.86656	.85690	.84779	.83915
14	.93793	.92446	.91196	.90032	.88942	.87918	.86953	.86041
15	.96401	.94948	.93606	.92361	.91199	.90112	.89090	.88126
16	.99043	.97467	.96021	.94685	.93445	.92287	.91202	.90182

M \ N	25	26	27	28	29	30	31	32
17	1.01747	1.00028	.98461	.97023	.95693	.94458	.93304	.92222
18	1.04548	1.02657	1.00949	.99392	.97961	.96638	.95408	.94258
19	1.07492	1.05389	1.03511	1.01814	1.00266	.98843	.97526	.96302
20	1.10640	1.08267	1.06180	1.04315	1.02629	1.01090	.99675	.98365
21	1.14086	1.11352	1.08998	1.06926	1.05074	1.03398	1.01869	1.00461
22	1.17982	1.14737	1.12025	1.09688	1.07631	1.05791	1.04127	1.02606
23	1.22615	1.18572	1.15353	1.12662	1.10343	1.08300	1.06472	1.04818
24	1.28650	1.23142	1.19131	1.15938	1.13268	1.10965	1.08936	1.07120

M \ N	25	26	27	28	29	30	31	32
25	1.38433	1.29109	1.23643	1.19664	1.16494	1.13843	1.11556	1.09541
26		1.38806	1.29546	1.24121	1.20171	1.17024	1.14392	1.12121
27			1.39162	1.29963	1.24577	1.20655	1.17530	1.14916
28				1.39503	1.30362	1.25012	1.21118	1.18015
29					1.39829	1.30744	1.25430	1.21561
30						1.40143	1.31111	1.25830
31							1.40444	1.31463
32								1.40733

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=4.0

M \ N	33	34	35	36	37	38	39	40
1	.37817	.37536	.37265	.37004	.36751	.36507	.36271	.36042
2	.47455	.47097	.46752	.46419	.46097	.45787	.45486	.45196
3	.53599	.53188	.52792	.52411	.52043	.51687	.51343	.51011
4	.58304	.57849	.57411	.56990	.56583	.56191	.55812	.55445
5	.62208	.61714	.61240	.60783	.60343	.59918	.59508	.59111
6	.65601	.65071	.64562	.64072	.63601	.63146	.62707	.62283
7	.68640	.68075	.67532	.67011	.66509	.66026	.65560	.65110
8	.71418	.70819	.70244	.69692	.69161	.68650	.68157	.67682

M \ N	33	34	35	36	37	38	39	40
9	.74000	.73366	.72759	.72176	.71616	.71078	.70559	.70059
10	.76430	.75761	.75121	.74507	.73918	.73352	.72807	.72282
11	.78740	.78035	.77361	.76716	.76098	.75504	.74932	.74382
12	.80955	.80213	.79505	.78827	.78179	.77556	.76958	.76383
13	.83095	.82314	.81570	.80859	.80179	.79527	.78902	.78300
14	.85176	.84355	.83574	.82828	.82115	.81433	.80779	.80151
15	.87214	.86350	.85528	.84745	.83999	.83285	.82601	.81945
16	.89220	.88309	.87445	.86623	.85841	.85093	.84379	.83694

M \ N	33	34	35	36	37	38	39	40
17	.91205	.90244	.89335	.88472	.87651	.86868	.86121	.85406
18	.93180	.92165	.91207	.90299	.89438	.88618	.87836	.87088
19	.95157	.94082	.93070	.92115	.91209	.90349	.89530	.88749
20	.97145	.96005	.94934	.93926	.92972	.92069	.91211	.90393
21	.99157	.97943	.96808	.95741	.94736	.93786	.92885	.92028
22	1.01206	.99909	.98700	.97570	.96507	.95505	.94558	.93659
23	1.03306	1.01913	1.00623	.99420	.98294	.97236	.96237	.95293
24	1.05475	1.03972	1.02587	1.01302	1.00105	.98984	.97930	.96935

M \ N	33	34	35	36	37	38	39	40
25	1.07737	1.06102	1.04607	1.03229	1.01951	1.00759	.99643	.98593
26	1.10118	1.08325	1.06700	1.05213	1.03842	1.02571	1.01384	1.00273
27	1.12660	1.10670	1.08888	1.07272	1.05793	1.04429	1.03164	1.01983
28	1.15418	1.13176	1.11198	1.09426	1.07819	1.06349	1.04992	1.03732
29	1.18478	1.15898	1.13670	1.11704	1.09943	1.08345	1.06882	1.05532
30	1.21986	1.18923	1.16359	1.14145	1.12190	1.10439	1.08849	1.07394
31	1.26214	1.22394	1.19351	1.16802	1.14601	1.12658	1.10915	1.09334
32	1.31802	1.26584	1.22787	1.19762	1.17228	1.15039	1.13107	1.11374

M \ N	33	34	35	36	37	38	39	40
33	1.41012	1.32128	1.26940	1.23165	1.20157	1.17639	1.15462	1.13540
34		1.41282	1.32442	1.27283	1.23530	1.20539	1.18034	1.15870
35			1.41542	1.32746	1.27614	1.23882	1.20907	1.18416
36				1.41793	1.33039	1.27934	1.24222	1.21263
37					1.42036	1.33322	1.28244	1.24550
38						1.42272	1.33597	1.28543
39							1.42500	1.33863
40								1.42721

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=5.0

M \ N	1	2	3	4	5	6	7	8
1	.91817	.79931	.73705	.69584	.66547	.64164	.62216	.60577
2		1.03703	.92383	.86068	.81733	.78461	.75852	.73693
3			1.09362	.98698	.92572	.88276	.84985	.82329
4				1.12917	1.02783	.96867	.92664	.89410
5					1.15450	1.05740	1.00020	.95918
6						1.17392	1.08028	1.02480
7							1.18953	1.09878
8								1.20250

M \ N	9	10	11	12	13	14	15	16
1	.59166	.57933	.56839	.55858	.54971	.54162	.53420	.52735
2	.71859	.70270	.68871	.67625	.66503	.65485	.64553	.63697
3	.80113	.78216	.76563	.75102	.73794	.72613	.71538	.70552
4	.86763	.84538	.82624	.80948	.79460	.78125	.76915	.75811
5	.92719	.90100	.87887	.85975	.84295	.82799	.81451	.80228
6	.98478	.95338	.92755	.90564	.88664	.86989	.85493	.84143
7	1.04482	1.00571	.97490	.94946	.92781	.90898	.89233	.87743
8	1.11420	1.06157	1.02331	.99307	.96803	.94665	.92800	.91149

M \ N	9	10	11	12	13	14	15	16
9	1.21353	1.12735	1.07592	1.03844	1.00873	.98406	.96296	.94452
10		1.22311	1.13878	1.08842	1.05164	1.02243	.99813	.97730
11			1.23154	1.14885	1.09945	1.06332	1.03458	1.01063
12				1.23906	1.15783	1.10930	1.07377	1.04547
13					1.24583	1.16592	1.11819	1.08321
14						1.25197	1.17327	1.12626
15							1.25760	1.17998
16								1.26277

M \ N	17	18	19	20	21	22	23	24
1	.52099	.51507	.50953	.50433	.49943	.49481	.49043	.48627
2	.62904	.62167	.61479	.60834	.60228	.59656	.59116	.58604
3	.69643	.68800	.68015	.67281	.66592	.65943	.65331	.64751
4	.74796	.73858	.72987	.72175	.71414	.70699	.70025	.69388
5	.79109	.78078	.77124	.76237	.75408	.74630	.73899	.73209
6	.82914	.81788	.80749	.79786	.78889	.78050	.77263	.76521
7	.86395	.85167	.84039	.82997	.82029	.81127	.80282	.79488
8	.89668	.88326	.87100	.85974	.84931	.83963	.83058	.82210

M \ N	17	18	19	20	21	22	23	24
9	.92815	.91345	.90011	.88791	.87667	.86627	.85659	.84754
10	.95907	.94286	.92827	.91502	.90288	.89170	.88133	.87167
11	.99006	.97203	.95598	.94152	.92837	.91631	.90518	.89485
12	1.02185	1.00154	.98371	.96781	.95348	.94043	.92845	.91738
13	1.05531	1.03200	1.01194	.99430	.97857	.96436	.95141	.93951
14	1.09179	1.06428	1.04126	1.02143	1.00399	.98840	.97432	.96147
15	1.13365	1.09965	1.07250	1.04976	1.03015	1.01289	.99746	.98350
16	1.18616	1.14044	1.10689	1.08008	1.05761	1.03821	1.02112	1.00583

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=5.0

M \ N	17	18	19	20	21	22	23	24
17	1.26756	1.19187	1.14673	1.11360	1.08710	1.06488	1.04569	1.02877
18		1.27201	1.19719	1.15258	1.11983	1.09363	1.07165	1.05266
19			1.27617	1.20214	1.15804	1.12566	1.09974	1.07798
20				1.28006	1.20678	1.16315	1.13111	1.10546
21					1.28373	1.21115	1.16796	1.13624
22						1.28718	1.21526	1.17249
23							1.29045	1.21915
24								1.29355

M \ N	25	26	27	28	29	30	31	32
1	.48232	.47855	.47495	.47151	.46821	.46505	.46201	.45908
2	.58117	.57653	.57211	.56789	.56384	.55997	.55624	.55266
3	.64201	.63678	.63180	.62704	.62249	.61813	.61395	.60993
4	.68785	.68212	.67666	.67146	.66649	.66173	.65717	.65279
5	.72557	.71937	.71349	.70788	.70253	.69741	.69251	.68781
6	.75820	.75157	.74527	.73928	.73357	.72811	.72289	.71789
7	.78739	.78032	.77361	.76724	.76118	.75539	.74986	.74457
8	.81412	.80660	.79948	.79273	.78631	.78019	.77435	.76877

M \ N	25	26	27	28	29	30	31	32
9	.83905	.83106	.82351	.81636	.80958	.80313	.79698	.79110
10	.86263	.85415	.84615	.83860	.83144	.82464	.81816	.81199
11	.88522	.87621	.86774	.85975	.85220	.84504	.83823	.83175
12	.90711	.89752	.88853	.88008	.87211	.86457	.85741	.85061
13	.92851	.91829	.90875	.89980	.89138	.88343	.87590	.86875
14	.94966	.93874	.92857	.91908	.91017	.90177	.89385	.88634
15	.97075	.95903	.94817	.93807	.92862	.91975	.91140	.90350
16	.99199	.97935	.96771	.95693	.94689	.93749	.92867	.92035

M \ N	25	26	27	28	29	30	31	32
17	1.01362	.99990	.98735	.97580	.96509	.95511	.94577	.93699
18	1.03590	1.02088	1.00727	.99483	.98336	.97272	.96280	.95351
19	1.05917	1.04257	1.02769	1.01419	1.00184	.99045	.97988	.97003
20	1.08392	1.06529	1.04884	1.03408	1.02069	1.00843	.99712	.98663
21	1.11085	1.08951	1.07105	1.05474	1.04010	1.02682	1.01465	1.00342
22	1.14108	1.11592	1.09479	1.07649	1.06031	1.04580	1.03261	1.02053
23	1.17677	1.14566	1.12073	1.09978	1.08164	1.06559	1.05119	1.03810
24	1.22283	1.18083	1.14999	1.12528	1.10451	1.08652	1.07060	1.05631

M \ N	25	26	27	28	29	30	31	32
25	1.29650	1.22633	1.18469	1.15411	1.12961	1.10901	1.09116	1.07537
26		1.29931	1.22967	1.18835	1.15803	1.13373	1.11330	1.09558
27			1.30198	1.23284	1.19185	1.16177	1.13766	1.11738
28				1.30454	1.23588	1.19520	1.16534	1.14141
29					1.30700	1.23879	1.19839	1.16876
30						1.30935	1.24157	1.20146
31							1.31161	1.24425
32								1.31378

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=5.0

M \ N	33	34	35	36	37	38	39	40
1	.45627	.45355	.45093	.44840	.44595	.44357	.44128	.43905
2	.54922	.54590	.54269	.53960	.53661	.53372	.53091	.52820
3	.60606	.60234	.59875	.59529	.59194	.58870	.58557	.58253
4	.64858	.64453	.64063	.63686	.63323	.62971	.62631	.62302
5	.68330	.67896	.67478	.67075	.66686	.66310	.65947	.65595
6	.71309	.70848	.70404	.69977	.69564	.69166	.68781	.68409
7	.73949	.73462	.72993	.72542	.72107	.71688	.71283	.70891
8	.76342	.75829	.75336	.74862	.74405	.73965	.73540	.73130

M \ N	33	34	35	36	37	38	39	40
9	.78548	.78009	.77492	.76995	.76517	.76056	.75612	.75183
10	.80609	.80044	.79503	.78983	.78483	.78002	.77538	.77090
11	.82556	.81965	.81398	.80855	.80333	.79831	.79347	.78881
12	.84412	.83793	.83201	.82633	.82088	.81565	.81061	.80576
13	.86195	.85547	.84928	.84336	.83768	.83222	.82698	.82194
14	.87921	.87242	.86595	.85976	.85384	.84816	.84271	.83746
15	.89602	.88891	.88213	.87567	.86949	.86358	.85790	.85245
16	.91248	.90502	.89794	.89118	.88473	.87857	.87266	.86699

M \ N	33	34	35	36	37	38	39	40
17	.92871	.92087	.91344	.90638	.89964	.89321	.88706	.88116
18	.94478	.93654	.92874	.92134	.91430	.90759	.90118	.89504
19	.96079	.95210	.94390	.93614	.92877	.92176	.91507	.90868
20	.97683	.96765	.95901	.95085	.94312	.93578	.92880	.92213
21	.99299	.98326	.97413	.96553	.95742	.94973	.94242	.93546
22	1.00938	.99902	.98934	.98027	.97172	.96364	.95599	.94872
23	1.02611	1.01503	1.00474	.99512	.98609	.97759	.96956	.96194
24	1.04332	1.03141	1.02040	1.01017	1.00061	.99164	.98318	.97519

M \ N	33	34	35	36	37	38	39	40
25	1.06118	1.04828	1.03645	1.02552	1.01535	1.00585	.99692	.98851
26	1.07991	1.06582	1.05301	1.04126	1.03040	1.02029	1.01084	1.00197
27	1.09980	1.08424	1.07026	1.05753	1.04586	1.03506	1.02502	1.01562
28	1.12129	1.10384	1.08839	1.07450	1.06186	1.05026	1.03953	1.02954
29	1.14501	1.12503	1.10770	1.09236	1.07856	1.06600	1.05447	1.04381
30	1.17204	1.14845	1.12861	1.11140	1.09616	1.08245	1.06998	1.05852
31	1.20440	1.17518	1.15176	1.13205	1.11496	1.09982	1.08620	1.07380
32	1.24682	1.20723	1.17820	1.15494	1.13536	1.11838	1.10333	1.08980

M \ N	33	34	35	36	37	38	39	40
33	1.31587	1.24929	1.20995	1.18111	1.15800	1.13855	1.12167	1.10672
34		1.31789	1.25167	1.21257	1.18391	1.16094	1.14161	1.12484
35			1.31984	1.25397	1.21510	1.18661	1.16378	1.14457
36				1.32172	1.25620	1.21754	1.18922	1.16653
37					1.32354	1.25834	1.21990	1.19174
38						1.32530	1.26042	1.22219
39							1.32701	1.26243
40								1.32867

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=6.0

M \ N	1	2	3	4	5	6	7	8
1	.92772	.82650	.77250	.73633	.70945	.68822	.67076	.65600
2		1.02893	.93452	.88099	.84386	.81562	.79295	.77410
3			1.07614	.98805	.93669	.90034	.87228	.84951
4				1.10551	1.02229	.97305	.93775	.91023
5					1.12631	1.04690	.99952	.96526
6						1.14219	1.06586	1.02008
7							1.15492	1.08112
8								1.16546

M \ N	9	10	11	12	13	14	15	16
1	.64324	.63205	.62209	.61313	.60501	.59758	.59075	.58443
2	.75801	.74402	.73166	.72061	.71063	.70155	.69323	.68555
3	.83041	.81400	.79964	.78690	.77547	.76511	.75566	.74697
4	.88772	.86871	.85229	.83786	.82501	.81344	.80293	.79331
5	.93837	.91623	.89744	.88115	.86677	.85393	.84234	.83178
6	.98678	.96050	.93877	.92026	.90414	.88989	.87712	.86556
7	1.03672	1.00430	.97861	.95729	.93906	.92315	.90904	.89638
8	1.09380	1.05062	1.01898	.99384	.97291	.95497	.93928	.92533

M \ N	9	10	11	12	13	14	15	16
9	1.17442	1.10460	1.06248	1.03156	1.00692	.98636	.96871	.95323
10		1.18217	1.11396	1.07279	1.04251	1.01834	.99813	.98075
11			1.18900	1.12219	1.08187	1.05218	1.02844	1.00856
12				1.19507	1.12953	1.08997	1.06081	1.03747
13					1.20053	1.13612	1.09726	1.06860
14						1.20549	1.14210	1.10387
15							1.21001	1.14756
16								1.21418

M \ N	17	18	19	20	21	22	23	24
1	.57855	.57307	.56793	.56309	.55853	.55422	.55013	.54624
2	.67843	.67180	.66560	.65978	.65430	.64912	.64421	.63956
3	.73894	.73148	.72451	.71799	.71186	.70608	.70061	.69543
4	.78445	.77624	.76861	.76147	.75478	.74848	.74253	.73690
5	.82210	.81317	.80488	.79715	.78992	.78313	.77673	.77069
6	.85502	.84533	.83637	.82805	.82029	.81301	.80617	.79972
7	.88489	.87439	.86473	.85579	.84747	.83969	.83240	.82553
8	.91278	.90139	.89096	.88134	.87243	.86413	.85636	.84907

M \ N	17	18	19	20	21	22	23	24
9	.93944	.92703	.91573	.90538	.89582	.88696	.87869	.87095
10	.96548	.95186	.93958	.92839	.91812	.90863	.89982	.89159
11	.99143	.97637	.96292	.95077	.93968	.92950	.92009	.91133
12	1.01791	1.00102	.98615	.97286	.96084	.94987	.93977	.93043
13	1.04562	1.02635	1.00969	.99501	.98188	.96998	.95912	.94911
14	1.07566	1.05304	1.03403	1.01760	1.00310	.99011	.97834	.96758
15	1.10992	1.08213	1.05982	1.04108	1.02485	1.01052	.99768	.98603
16	1.15258	1.11547	1.08808	1.06607	1.04757	1.03154	1.01737	1.00466

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=6.0

M \ N	17	18	19	20	21	22	23	24
17	1.21803	1.15722	1.12061	1.09358	1.07186	1.05358	1.03774	1.02373
18		1.22160	1.16152	1.12538	1.09869	1.07723	1.05917	1.04350
19			1.22494	1.16554	1.12983	1.10346	1.08225	1.06439
20				1.22807	1.16930	1.13399	1.10792	1.08695
21					1.23101	1.17283	1.13790	1.11211
22						1.23378	1.17615	1.14159
23							1.23640	1.17930
24								1.23888

M \ N	25	26	27	28	29	30	31	32
1	.54253	.53900	.53562	.53238	.52928	.52630	.52343	.52066
2	.63513	.63091	.62687	.62301	.61931	.61576	.61235	.60906
3	.69050	.68581	.68133	.67706	.67296	.66903	.66525	.66162
4	.73155	.72647	.72162	.71700	.71257	.70833	.70426	.70035
5	.76496	.75951	.75433	.74939	.74466	.74014	.73581	.73164
6	.79361	.78782	.78231	.77707	.77206	.76727	.76269	.75829
7	.81905	.81291	.80709	.80154	.79626	.79121	.78638	.78175
8	.84220	.83571	.82956	.82371	.81815	.81284	.80777	.80292

M \ N	25	26	27	28	29	30	31	32
9	.86367	.85681	.85032	.84417	.83832	.83275	.82743	.82234
10	.88388	.87663	.86979	.86331	.85716	.85132	.84575	.84043
11	.90315	.89548	.88826	.88144	.87499	.86886	.86302	.85745
12	.92174	.91361	.90599	.89880	.89201	.88558	.87946	.87364
13	.93985	.93122	.92315	.91557	.90842	.90166	.89526	.88917
14	.95767	.94848	.93991	.93190	.92436	.91726	.91053	.90416
15	.97537	.96554	.95643	.94793	.93997	.93248	.92542	.91873
16	.99313	.98258	.97284	.96380	.95536	.94746	.94002	.93300

M \ N	25	26	27	28	29	30	31	32
17	1.01115	.99973	.98927	.97962	.97065	.96228	.95443	.94704
18	1.02964	1.01719	1.00589	.99552	.98595	.97705	.96874	.96095
19	1.04889	1.03518	1.02285	1.01165	1.00137	.99188	.98305	.97480
20	1.06928	1.05395	1.04037	1.02816	1.01705	1.00687	.99745	.98869
21	1.09137	1.07388	1.05870	1.04525	1.03315	1.02215	1.01204	1.00270
22	1.11607	1.09553	1.07822	1.06319	1.04986	1.03787	1.02696	1.01694
23	1.14507	1.11980	1.09947	1.08232	1.06743	1.05422	1.04233	1.03151
24	1.18227	1.14836	1.12333	1.10319	1.08621	1.07145	1.05835	1.04657

M \ N	25	26	27	28	29	30	31	32
25	1.24124	1.18510	1.15149	1.12669	1.10673	1.08990	1.07526	1.06228
26		1.24348	1.18779	1.15447	1.12988	1.11010	1.09341	1.07890
27			1.24563	1.19035	1.15731	1.13293	1.11331	1.09676
28				1.24767	1.19280	1.16002	1.13583	1.11638
29					1.24963	1.19514	1.16261	1.13861
30						1.25151	1.19738	1.16509
31							1.25332	1.19953
32								1.25505

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=6.0

M \ N	33	34	35	36	37	38	39	40
1	.51800	.51543	.51295	.51054	.50822	.50596	.50378	.50166
2	.60590	.60284	.59989	.59704	.59428	.59161	.58902	.58651
3	.65813	.65476	.65150	.64836	.64532	.64238	.63953	.63676
4	.69658	.69295	.68946	.68608	.68281	.67965	.67659	.67363
5	.72764	.72378	.72007	.71648	.71302	.70967	.70643	.70329
6	.75406	.74999	.74608	.74230	.73865	.73513	.73172	.72841
7	.77731	.77304	.76893	.76497	.76114	.75745	.75388	.75043
8	.79826	.79379	.78948	.78534	.78135	.77749	.77377	.77017

M \ N	33	34	35	36	37	38	39	40
9	.81747	.81279	.80830	.80398	.79982	.79580	.79193	.78818
10	.83533	.83045	.82577	.82127	.81693	.81276	.80873	.80483
11	.85214	.84705	.84216	.83748	.83297	.82863	.82444	.82040
12	.86809	.86278	.85770	.85282	.84813	.84362	.83928	.83509
13	.88336	.87782	.87253	.86745	.86258	.85790	.85339	.84905
14	.89809	.89231	.88679	.88151	.87644	.87158	.86691	.86241
15	.91239	.90635	.90059	.89509	.88983	.88478	.87993	.87527
16	.92635	.92003	.91403	.90829	.90281	.89757	.89253	.88770

M \ N	33	34	35	36	37	38	39	40
17	.94006	.93345	.92717	.92119	.91548	.91003	.90480	.89979
18	.95361	.94667	.94010	.93385	.92790	.92222	.91679	.91159
19	.96706	.95977	.95288	.94635	.94013	.93422	.92856	.92315
20	.98051	.97282	.96558	.95873	.95223	.94605	.94017	.93454
21	.99401	.98589	.97825	.97106	.96425	.95779	.95165	.94579
22	1.00767	.99904	.99097	.98339	.97624	.96948	.96306	.95695
23	1.02157	1.01237	1.00381	.99580	.98827	.98116	.97444	.96806
24	1.03583	1.02597	1.01684	1.00834	1.00038	.99290	.98584	.97916

M \ N	33	34	35	36	37	38	39	40
25	1.05059	1.03994	1.03016	1.02109	1.01265	1.00475	.99731	.99030
26	1.06602	1.05443	1.04386	1.03414	1.02515	1.01676	1.00891	1.00152
27	1.08237	1.06959	1.05808	1.04759	1.03795	1.02901	1.02069	1.01289
28	1.09996	1.08568	1.07300	1.06158	1.05117	1.04159	1.03272	1.02444
29	1.11931	1.10302	1.08885	1.07626	1.06493	1.05459	1.04508	1.03626
30	1.14128	1.12212	1.10595	1.09188	1.07939	1.06813	1.05787	1.04842
31	1.16747	1.14383	1.12481	1.10876	1.09480	1.08240	1.07121	1.06102
32	1.20160	1.16976	1.14629	1.12740	1.11146	1.09760	1.08528	1.07417

M \ N	33	34	35	36	37	38	39	40
33	1.25672	1.20359	1.17196	1.14865	1.12989	1.11406	1.10029	1.08806
34		1.25833	1.20551	1.17408	1.15092	1.13229	1.11657	1.10289
35			1.25989	1.20736	1.17612	1.15311	1.13460	1.11898
36				1.26139	1.20914	1.17809	1.15523	1.13684
37					1.26284	1.21087	1.18000	1.15727
38						1.26424	1.21254	1.18184
39							1.26560	1.21415
40								1.26692

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=7.0

M \ N	1	2	3	4	5	6	7	8
1	.93544	.84725	.79957	.76737	.74330	.72419	.70841	.69503
2		1.02363	.94261	.89615	.86368	.83885	.81883	.80211
3			1.06414	.98907	.94486	.91334	.88889	.86897
4				1.08916	1.01855	.97637	.94594	.92210
5					1.10681	1.03964	.99919	.96978
6						1.12024	1.05582	1.01685
7							1.13098	1.06881
8								1.13986

M \ N	9	10	11	12	13	14	15	16
1	.68343	.67322	.66412	.65591	.64846	.64163	.63533	.62950
2	.78780	.77532	.76426	.75436	.74540	.73723	.72973	.72279
3	.85220	.83774	.82506	.81378	.80363	.79443	.78601	.77825
4	.90252	.88593	.87156	.85890	.84759	.83739	.82811	.81960
5	.94657	.92740	.91108	.89688	.88433	.87309	.86292	.85364
6	.98834	.96574	.94699	.93096	.91697	.90456	.89343	.88333
7	1.03110	1.00341	.98137	.96302	.94728	.93351	.92127	.91026
8	1.07958	1.04297	1.01600	.99448	.97650	.96105	.94750	.93543

M \ N	9	10	11	12	13	14	15	16
9	1.14739	1.08874	1.05308	1.02676	1.00571	.98809	.97291	.95957
10		1.15391	1.09666	1.06185	1.03612	1.01550	.99821	.98329
11			1.15964	1.10363	1.06957	1.04437	1.02414	1.00716
12				1.16473	1.10982	1.07644	1.05173	1.03186
13					1.16930	1.11538	1.08262	1.05835
14						1.17345	1.12042	1.08822
15							1.17724	1.12502
16								1.18072

M \ N	17	18	19	20	21	22	23	24
1	.62407	.61900	.61424	.60975	.60552	.60151	.59770	.59408
2	.71636	.71035	.70473	.69944	.69446	.68974	.68527	.68103
3	.77108	.76440	.75816	.75230	.74679	.74159	.73667	.73199
4	.81175	.80447	.79768	.79133	.78536	.77974	.77442	.76939
5	.84512	.83724	.82992	.82309	.81669	.81067	.80498	.79961
6	.87410	.86560	.85774	.85042	.84358	.83716	.83112	.82541
7	.90025	.89109	.88264	.87481	.86752	.86069	.85428	.84824
8	.92455	.91465	.90557	.89718	.88940	.88215	.87535	.86895

M \ N	17	18	19	20	21	22	23	24
9	.94767	.93692	.92713	.91814	.90983	.90210	.89489	.88813
10	.97015	.95842	.94781	.93812	.92922	.92099	.91332	.90616
11	.99248	.97954	.96797	.95749	.94791	.93910	.93095	.92335
12	1.01516	1.00072	.98796	.97654	.96619	.95672	.94801	.93992
13	1.03882	1.02239	1.00816	.99558	.98430	.97408	.96472	.95609
14	1.06435	1.04514	1.02896	1.01493	1.00252	.99138	.98128	.97202
15	1.09334	1.06984	1.05092	1.03497	1.02113	1.00888	.99788	.98789
16	1.12925	1.09804	1.07489	1.05624	1.04050	1.02685	1.01475	1.00388

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=7.0

M \ N	17	18	19	20	21	22	23	24
17	1.18394	1.13315	1.10238	1.07955	1.06115	1.04563	1.03214	1.02019
18		1.18692	1.13677	1.10640	1.08388	1.06572	1.05039	1.03706
19			1.18971	1.14014	1.11016	1.08792	1.06998	1.05483
20				1.19232	1.14330	1.11367	1.09169	1.07397
21					1.19477	1.14626	1.11696	1.09524
22						1.19708	1.14905	1.12007
23							1.19926	1.15169
24								1.20133

M \ N	25	26	27	28	29	30	31	32
1	.59062	.58732	.58416	.58114	.57823	.57544	.57275	.57016
2	.67698	.67312	.66943	.66589	.66250	.65925	.65611	.65309
3	.72755	.72331	.71926	.71539	.71167	.70811	.70468	.70139
4	.76460	.76005	.75570	.75154	.74756	.74375	.74008	.73656
5	.79451	.78966	.78504	.78063	.77641	.77237	.76849	.76476
6	.82001	.81487	.80999	.80533	.80088	.79663	.79254	.78862
7	.84252	.83711	.83197	.82707	.82239	.81792	.81364	.80953
8	.86293	.85722	.85181	.84666	.84176	.83708	.83260	.82831

M \ N	25	26	27	28	29	30	31	32
9	.88177	.87576	.87007	.86467	.85954	.85464	.84996	.84548
10	.89944	.89311	.88714	.88147	.87609	.87097	.86608	.86141
11	.91624	.90957	.90328	.89733	.89169	.88634	.88123	.87636
12	.93239	.92534	.91872	.91247	.90656	.90095	.89562	.89053
13	.94808	.94062	.93362	.92705	.92084	.91497	.90939	.90409
14	.96348	.95555	.94815	.94121	.93469	.92852	.92269	.91715
15	.97873	.97027	.96242	.95508	.94821	.94173	.93561	.92981
16	.99399	.98493	.97656	.96878	.96150	.95468	.94825	.94218

M \ N	25	26	27	28	29	30	31	32
17	1.00944	.99966	.99069	.98239	.97468	.96747	.96071	.95433
18	1.02524	1.01461	1.00494	.99605	.98784	.98020	.97305	.96633
19	1.04166	1.02997	1.01945	1.00987	1.00107	.99293	.98536	.97827
20	1.05899	1.04596	1.03440	1.02399	1.01450	1.00579	.99772	.99021
21	1.07771	1.06290	1.05001	1.03856	1.02825	1.01886	1.01022	1.00223
22	1.09858	1.08124	1.06658	1.05382	1.04249	1.03228	1.02297	1.01441
23	1.12300	1.10173	1.08457	1.07006	1.05743	1.04621	1.03609	1.02686
24	1.15418	1.12577	1.10472	1.08772	1.07336	1.06084	1.04972	1.03970

M \ N	25	26	27	28	29	30	31	32
25	1.20330	1.15655	1.12840	1.10755	1.09072	1.07648	1.06409	1.05307
26		1.20517	1.15880	1.13091	1.11024	1.09356	1.07946	1.06717
27			1.20695	1.16095	1.13329	1.11281	1.09628	1.08229
28				1.20865	1.16300	1.13557	1.11526	1.09887
29					1.21028	1.16496	1.13774	1.11760
30						1.21185	1.16683	1.13983
31							1.21335	1.16863
32								1.21479

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=7.0

M \ N	33	34	35	36	37	38	39	40
1	.56765	.56524	.56290	.56064	.55845	.55633	.55427	.55227
2	.65018	.64737	.64466	.64203	.63949	.63702	.63463	.63231
3	.69821	.69514	.69218	.68932	.68655	.68386	.68126	.67873
4	.73316	.72989	.72673	.72368	.72072	.71786	.71509	.71240
5	.76117	.75771	.75438	.75116	.74804	.74503	.74211	.73928
6	.78485	.78122	.77772	.77435	.77109	.76793	.76488	.76192
7	.80559	.80179	.79813	.79461	.79120	.78791	.78473	.78165
8	.82419	.82023	.81642	.81274	.80920	.80578	.80247	.79926

M \ N	33	34	35	36	37	38	39	40
9	.84118	.83706	.83309	.82927	.82559	.82203	.81860	.81528
10	.85693	.85264	.84851	.84455	.84073	.83704	.83348	.83004
11	.87170	.86723	.86295	.85883	.85486	.85105	.84736	.84380
12	.88568	.88103	.87658	.87231	.86820	.86424	.86043	.85674
13	.89903	.89420	.88957	.88513	.88087	.87677	.87282	.86902
14	.91187	.90684	.90203	.89742	.89300	.88875	.88467	.88073
15	.92431	.91906	.91406	.90927	.90468	.90028	.89605	.89198
16	.93642	.93095	.92574	.92076	.91599	.91143	.90705	.90284

M \ N	33	34	35	36	37	38	39	40
17	.94830	.94258	.93714	.93196	.92701	.92227	.91773	.91337
18	.96000	.95402	.94834	.94293	.93778	.93286	.92815	.92363
19	.97161	.96533	.95938	.95374	.94837	.94325	.93836	.93367
20	.98318	.97657	.97033	.96443	.95883	.95349	.94840	.94354
21	.99478	.98780	.98124	.97505	.96919	.96363	.95833	.95327
22	1.00648	.99910	.99218	.98567	.97952	.97370	.96817	.96290
23	1.01838	1.01051	1.00318	.99632	.98986	.98375	.97797	.97248
24	1.03055	1.02214	1.01434	1.00707	1.00025	.99384	.98778	.98203

M \ N	33	34	35	36	37	38	39	40
25	1.04313	1.03406	1.02571	1.01797	1.01076	1.00399	.99762	.99160
26	1.05625	1.04639	1.03740	1.02912	1.02144	1.01428	1.00756	1.00123
27	1.07011	1.05928	1.04950	1.04058	1.03237	1.02475	1.01763	1.01096
28	1.08500	1.07292	1.06218	1.05248	1.04363	1.03547	1.02791	1.02084
29	1.10134	1.08759	1.07561	1.06495	1.05532	1.04654	1.03844	1.03093
30	1.11984	1.10371	1.09007	1.07818	1.06760	1.05805	1.04933	1.04129
31	1.14182	1.12199	1.10599	1.09245	1.08065	1.07015	1.06067	1.05201
32	1.17036	1.14374	1.12406	1.10817	1.09473	1.08302	1.07259	1.06318

M \ N	33	34	35	36	37	38	39	40
33	1.21618	1.17203	1.14559	1.12604	1.11027	1.09693	1.08530	1.07495
34		1.21752	1.17363	1.14737	1.12795	1.11229	1.09904	1.08749
35			1.21881	1.17517	1.14908	1.12980	1.11424	1.10108
36				1.22005	1.17666	1.15073	1.13157	1.11612
37					1.22126	1.17811	1.15233	1.13329
38						1.22242	1.17950	1.15387
39							1.22355	1.18085
40								1.22465

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=8.0

M \ N	1	2	3	4	5	6	7	8
1	.94174	.86358	.82090	.79191	.77012	.75277	.73841	.72618
2		1.01990	.94894	.90789	.87904	.85689	.83897	.82396
3			1.05539	.98999	.95116	.92335	.90169	.88398
4				1.07719	1.01587	.97898	.95223	.93120
5					1.09251	1.03432	.99904	.97326
6						1.10415	1.04843	1.01450
7							1.11344	1.05974
8								1.12111

M \ N	9	10	11	12	13	14	15	16
1	.71557	.70621	.69784	.69029	.68342	.67712	.67131	.66591
2	.81109	.79983	.78984	.78088	.77276	.76534	.75852	.75221
3	.86903	.85612	.84477	.83466	.82555	.81726	.80968	.80269
4	.91388	.89916	.88639	.87511	.86502	.85591	.84760	.83998
5	.95285	.93595	.92152	.90894	.89780	.88781	.87875	.87048
6	.98958	.96976	.95326	.93913	.92677	.91579	.90592	.89695
7	1.02696	1.00280	.98350	.96739	.95355	.94141	.93060	.92086
8	1.06911	1.03732	1.01382	.99501	.97926	.96569	.95376	.94312

M \ N	9	10	11	12	13	14	15	16
9	1.12761	1.07705	1.04613	1.02323	1.00485	.98943	.97613	.96441
10		1.13323	1.08392	1.05377	1.03140	1.01342	.99831	.98524
11			1.13816	1.08995	1.06048	1.03859	1.02097	1.00615
12				1.14254	1.09531	1.06645	1.04500	1.02771
13					1.14648	1.10012	1.07181	1.05076
14						1.15004	1.10448	1.07667
15							1.15330	1.10845
16								1.15629

M \ N	17	18	19	20	21	22	23	24
1	.66089	.65618	.65176	.64760	.64366	.63993	.63638	.63300
2	.74635	.74087	.73574	.73091	.72635	.72203	.71793	.71404
3	.79621	.79017	.78452	.77922	.77422	.76950	.76503	.76078
4	.83293	.82639	.82029	.81457	.80919	.80412	.79932	.79477
5	.86287	.85583	.84928	.84316	.83742	.83201	.82691	.82208
6	.88874	.88118	.87417	.86764	.86153	.85580	.85039	.84528
7	.91200	.90387	.89637	.88941	.88292	.87683	.87112	.86572
8	.93352	.92477	.91673	.90930	.90239	.89595	.88990	.88422

M \ N	17	18	19	20	21	22	23	24
9	.95393	.94446	.93582	.92787	.92052	.91368	.90728	.90128
10	.97372	.96340	.95406	.94553	.93768	.93040	.92362	.91728
11	.99331	.98197	.97181	.96260	.95417	.94641	.93921	.93250
12	1.01315	1.00052	.98936	.97934	.97025	.96193	.95426	.94714
13	1.03378	1.01946	1.00704	.99604	.98616	.97719	.96897	.96138
14	1.05598	1.03929	1.02520	1.01296	1.00211	.99237	.98351	.97539
15	1.08110	1.06075	1.04432	1.03044	1.01838	1.00768	.99806	.98931
16	1.11210	1.08517	1.06514	1.04895	1.03527	1.02337	1.01281	1.00331

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=8.0

M \ N	17	18	19	20	21	22	23	24
17	1.15905	1.11547	1.08893	1.06918	1.05322	1.03973	1.02799	1.01756
18		1.16161	1.11859	1.09241	1.07294	1.05719	1.04387	1.03228
19			1.16400	1.12150	1.09566	1.07644	1.06089	1.04774
20				1.16624	1.12422	1.09869	1.07971	1.06435
21					1.16834	1.12677	1.10154	1.08278
22						1.17032	1.12917	1.10422
23							1.17219	1.13144
24								1.17396

M \ N	25	26	27	28	29	30	31	32
1	.62978	.62670	.62375	.62092	.61820	.61559	.61307	.61064
2	.71033	.70678	.70339	.70014	.69702	.69402	.69113	.68835
3	.75673	.75287	.74919	.74565	.74227	.73901	.73588	.73287
4	.79044	.78632	.78238	.77862	.77501	.77155	.76822	.76502
5	.81749	.81312	.80896	.80498	.80117	.79752	.79401	.79064
6	.84043	.83583	.83144	.82726	.82326	.81943	.81575	.81222
7	.86062	.85578	.85117	.84679	.84260	.83859	.83475	.83106
8	.87884	.87376	.86893	.86434	.85995	.85577	.85176	.84792

M \ N	25	26	27	28	29	30	31	32
9	.89563	.89029	.88523	.88042	.87584	.87147	.86729	.86329
10	.91133	.90572	.90041	.89538	.89059	.88603	.88168	.87752
11	.92622	.92031	.91474	.90947	.90447	.89971	.89517	.89084
12	.94049	.93427	.92841	.92289	.91765	.91268	.90796	.90345
13	.95433	.94776	.94159	.93578	.93030	.92511	.92017	.91547
14	.96789	.96091	.95440	.94829	.94253	.93709	.93194	.92704
15	.98128	.97386	.96696	.96051	.95445	.94875	.94335	.93824
16	.99467	.98673	.97938	.97255	.96616	.96016	.95450	.94915

M \ N	25	26	27	28	29	30	31	32
17	1.00818	.99963	.99178	.98451	.97774	.97141	.96546	.95985
18	1.02198	1.01270	1.00425	.99648	.98928	.98258	.97631	.97041
19	1.03628	1.02611	1.01693	1.00857	1.00087	.99375	.98711	.98090
20	1.05136	1.04003	1.02997	1.02089	1.01261	1.00500	.99794	.99137
21	1.06760	1.05476	1.04356	1.03360	1.02462	1.01642	1.00888	1.00189
22	1.08567	1.07066	1.05795	1.04688	1.03702	1.02813	1.02001	1.01254
23	1.10675	1.08840	1.07355	1.06098	1.05001	1.04026	1.03145	1.02341
24	1.13359	1.10914	1.09098	1.07628	1.06384	1.05298	1.04332	1.03459

M \ N	25	26	27	28	29	30	31	32
25	1.17565	1.13562	1.11142	1.09343	1.07888	1.06655	1.05580	1.04623
26		1.17725	1.13756	1.11357	1.09576	1.08134	1.06913	1.05848
27			1.17877	1.13940	1.11563	1.09797	1.08369	1.07159
28				1.18023	1.14117	1.11759	1.10009	1.08593
29					1.18163	1.14285	1.11947	1.10211
30						1.18297	1.14446	1.12126
31							1.18425	1.14601
32								1.18548

EXPECTED VALUES OF WEIBULL ORDER STATISTICS

SHAPE PARAMETER K=8.0

M \ N	33	34	35	36	37	38	39	40
1	.60830	.60603	.60384	.60172	.59966	.59767	.59573	.59385
2	.68566	.68307	.68056	.67813	.67578	.67350	.67129	.66914
3	.72996	.72716	.72445	.72182	.71928	.71682	.71444	.71212
4	.76193	.75895	.75608	.75330	.75061	.74800	.74547	.74302
5	.78739	.78426	.78124	.77832	.77550	.77276	.77011	.76754
6	.80882	.80555	.80239	.79934	.79639	.79354	.79078	.78810
7	.82751	.82410	.82081	.81764	.81457	.81161	.80874	.80595
8	.84422	.84067	.83726	.83396	.83078	.82770	.82473	.82184

M \ N	33	34	35	36	37	38	39	40
9	.85945	.85576	.85221	.84879	.84550	.84231	.83923	.83625
10	.87353	.86970	.86602	.86247	.85906	.85576	.85258	.84950
11	.88669	.88272	.87890	.87523	.87169	.86829	.86499	.86181
12	.89913	.89501	.89105	.88725	.88359	.88006	.87666	.87338
13	.91099	.90670	.90260	.89865	.89487	.89122	.88771	.88432
14	.92237	.91791	.91365	.90957	.90565	.90188	.89825	.89475
15	.93337	.92874	.92431	.92007	.91601	.91211	.90836	.90474
16	.94407	.93924	.93464	.93024	.92603	.92199	.91811	.91438

M \ N	33	34	35	36	37	38	39	40
17	.95455	.94951	.94471	.94014	.93577	.93158	.92757	.92371
18	.96485	.95958	.95458	.94982	.94528	.94094	.93678	.93279
19	.97505	.96953	.96431	.95934	.95462	.95011	.94579	.94166
20	.98520	.97941	.97393	.96875	.96382	.95913	.95465	.95036
21	.99537	.98926	.98351	.97808	.97294	.96804	.96338	.95893
22	1.00561	.99915	.99309	.98739	.98200	.97690	.97204	.96741
23	1.01601	1.00914	1.00273	.99672	.99107	.98572	.98065	.97583
24	1.02663	1.01929	1.01248	1.00613	1.00017	.99455	.98925	.98421

M \ N	33	34	35	36	37	38	39	40
25	1.03758	1.02969	1.02241	1.01566	1.00936	1.00344	.99787	.99260
26	1.04899	1.04042	1.03260	1.02538	1.01868	1.01243	1.00656	1.00103
27	1.06103	1.05163	1.04313	1.03537	1.02822	1.02157	1.01537	1.00954
28	1.07394	1.06347	1.05415	1.04572	1.03802	1.03092	1.02433	1.01817
29	1.08808	1.07618	1.06580	1.05655	1.04820	1.04056	1.03351	1.02697
30	1.10405	1.09013	1.07833	1.06803	1.05886	1.05057	1.04299	1.03599
31	1.12298	1.10590	1.09209	1.08039	1.07017	1.06107	1.05284	1.04532
32	1.14749	1.12464	1.10769	1.09398	1.08237	1.07223	1.06319	1.05503

M \ N	33	34	35	36	37	38	39	40
33	1.18667	1.14892	1.12623	1.10940	1.09579	1.08427	1.07420	1.06524
34		1.18781	1.15030	1.12776	1.11105	1.09754	1.08610	1.07610
35			1.18892	1.15162	1.12923	1.11264	1.09922	1.08786
36				1.18998	1.15290	1.13065	1.11417	1.10085
37					1.19101	1.15414	1.13203	1.11565
38						1.19201	1.15534	1.13335
39							1.19297	1.15649
40								1.19391

Table C4

EXPECTED VALUES OF GAMMA ORDER STATISTICS

[$E(x_{M,N})$, where $x_{M,N}$ is the Mth order statistic of a sample of size N from a Gamma population with location parameter 0, scale parameter 1, and shape parameter $\alpha = 0.5(0.5)4.0$]

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=0.5

M \ N	1	2	3	4	5	6	7	8
1	0.50000	0.18169	0.09640	0.06035	0.04154	0.03042	0.02327	0.01840
2		0.81831	0.35227	0.20454	0.13560	0.09714	0.07329	0.05738
3			1.05133	0.50000	0.30796	0.21251	0.15679	0.12100
4				1.23511	0.62803	0.40340	0.28681	0.21645
5					1.38687	0.74034	0.49085	0.35717
6						1.51618	0.84014	0.57106
7							1.62886	0.92983
8								1.72872

M \ N	9	10	11	12	13	14	15	16
1	0.01492	0.01235	0.01040	0.00887	0.00766	0.00669	0.00589	0.00522
2	0.04622	0.03806	0.03190	0.02715	0.02339	0.02036	0.01790	0.01585
3	0.09647	0.07885	0.06574	0.05570	0.04782	0.04153	0.03641	0.03219
4	0.17005	0.13757	0.11382	0.09588	0.08195	0.07090	0.06199	0.05468
5	0.27445	0.21877	0.17912	0.14972	0.12721	0.10956	0.09542	0.08392
6	0.42335	0.33013	0.26634	0.22029	0.18572	0.15899	0.13783	0.12074
7	0.64491	0.48549	0.38328	0.31240	0.26062	0.22137	0.19074	0.16630
8	1.01123	0.71324	0.54390	0.43391	0.35677	0.29988	0.25637	0.22216

M \ N	9	10	11	12	13	14	15	16
9	1.81840	1.08573	0.77674	0.59890	0.48212	0.39944	0.33795	0.29058
10		1.89981	1.15440	0.83601	0.65081	0.52805	0.44044	0.37480
11			1.97435	1.21807	0.89158	0.69991	0.57186	0.47982
12				2.04310	1.27744	0.94385	0.74647	0.61369
13					2.10691	1.33304	0.99319	0.79074
14						2.16644	1.38532	1.03991
15							2.22223	1.43466
16								2.27474

M \ N	17	18	19	20	21	22	23	24
1	0.00466	0.00419	0.00379	0.00344	0.00314	0.00287	0.00264	0.00244
2	0.01414	0.01270	0.01146	0.01040	0.00948	0.00868	0.00797	0.00735
3	0.02868	0.02571	0.02319	0.02102	0.01914	0.01751	0.01608	0.01482
4	0.04861	0.04351	0.03918	0.03547	0.03227	0.02949	0.02705	0.02491
5	0.07441	0.06646	0.05974	0.05401	0.04907	0.04479	0.04105	0.03777
6	0.10673	0.09508	0.08528	0.07695	0.06980	0.06362	0.05824	0.05353
7	0.14643	0.13003	0.11632	0.10472	0.09481	0.08628	0.07887	0.07239
8	0.19468	0.17220	0.15354	0.13786	0.12453	0.11310	0.10321	0.09460

M \ N	17	18	19	20	21	22	23	24
9	0.25308	0.22278	0.19785	0.17707	0.15951	0.14453	0.13164	0.12044
10	0.32390	0.28339	0.25047	0.22326	0.20047	0.18115	0.16460	0.15030
11	0.41043	0.35632	0.31302	0.27767	0.24834	0.22366	0.20266	0.18462
12	0.51766	0.44487	0.38781	0.34194	0.30434	0.27301	0.24657	0.22399
13	0.65370	0.55406	0.47815	0.41838	0.37014	0.33044	0.29725	0.26914
14	0.83290	0.69203	0.58910	0.51033	0.44807	0.39763	0.35597	0.32104
15	1.08427	0.87315	0.72879	0.62285	0.54147	0.47689	0.42440	0.38093
16	1.48138	1.12650	0.91164	0.76410	0.65540	0.57160	0.50489	0.45049

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=0.5

M \ N	17	18	19	20	21	22	23	24
17	2.32432	1.52574	1.16678	0.94853	0.79807	0.68683	0.60079	0.53208
18		2.37130	1.56797	1.20530	0.98393	0.83079	0.71720	0.62908
19			2.41593	1.60827	1.24219	1.01796	0.86234	0.74657
20				2.45843	1.64680	1.27760	1.05072	0.89281
21					2.49902	1.68373	1.31163	1.08230
22						2.53784	1.71916	1.34439
23							2.57505	1.75323
24								2.61078

M \ N	25	26	27	28	29	30	31	32
1	0.00226	0.00209	0.00195	0.00182	0.00170	0.00159	0.00150	0.00141
2	0.00680	0.00631	0.00587	0.00547	0.00511	0.00479	0.00450	0.00423
3	0.01370	0.01270	0.01181	0.01101	0.01029	0.00964	0.00905	0.00851
4	0.02302	0.02133	0.01983	0.01847	0.01726	0.01616	0.01516	0.01425
5	0.03486	0.03229	0.02999	0.02793	0.02608	0.02441	0.02289	0.02151
6	0.04937	0.04568	0.04240	0.03946	0.03682	0.03444	0.03229	0.03033
7	0.06670	0.06166	0.05718	0.05317	0.04958	0.04635	0.04342	0.04077
8	0.08704	0.08037	0.07446	0.06918	0.06446	0.06021	0.05637	0.05290

M \ N	25	26	27	28	29	30	31	32
9	0.11066	0.10204	0.09442	0.08764	0.08158	0.07614	0.07124	0.06680
10	0.13784	0.12692	0.11729	0.10874	0.10111	0.09428	0.08813	0.08258
11	0.16898	0.15531	0.14330	0.13268	0.12322	0.11477	0.10719	0.10035
12	0.20452	0.18761	0.17279	0.15973	0.14814	0.13782	0.12857	0.12025
13	0.24507	0.22426	0.20613	0.19020	0.17613	0.16363	0.15246	0.14244
14	0.29136	0.26588	0.24380	0.22450	0.20752	0.19248	0.17910	0.16711
15	0.34435	0.31320	0.28639	0.26309	0.24269	0.22470	0.20874	0.19450
16	0.40531	0.36720	0.33466	0.30658	0.28213	0.26068	0.24173	0.22488

M \ N	25	26	27	28	29	30	31	32
17	0.47591	0.42912	0.38957	0.35572	0.32644	0.30090	0.27845	0.25857
18	0.55852	0.50068	0.45239	0.41147	0.37638	0.34597	0.31939	0.29599
19	0.65652	0.58423	0.52483	0.47512	0.43292	0.39665	0.36517	0.33760
20	0.77501	0.68315	0.60924	0.54837	0.49733	0.45392	0.41654	0.38403
21	0.92226	0.80257	0.70902	0.63358	0.57134	0.51904	0.47447	0.43604
22	1.11279	0.95075	0.82930	0.73416	0.65730	0.59375	0.54027	0.49461
23	1.37597	1.14225	0.97836	0.85525	0.75862	0.68041	0.61563	0.56102
24	1.78604	1.40645	1.17075	1.00512	0.88046	0.78243	0.70294	0.63699

M \ N	25	26	27	28	29	30	31	32
25	2.64515	1.81767	1.43592	1.19836	1.03109	0.90496	0.80561	0.72492
26		2.67825	1.84821	1.46442	1.22512	1.05631	0.92881	0.82821
27			2.71017	1.87773	1.49204	1.25109	1.08083	0.95203
28				2.74100	1.90630	1.51881	1.27632	1.10469
29					2.77081	1.93398	1.54479	1.30084
30						2.79967	1.96082	1.57002
31							2.82763	1.98688
32								2.85475

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=0.5

M \ N	33	34	35	36	37	38	39	40
1	0.00133	0.00125	0.00118	0.00112	0.00106	0.00101	0.00096	0.00092
2	0.00398	0.00376	0.00356	0.00337	0.00319	0.00303	0.00288	0.00274
3	0.00802	0.00757	0.00716	0.00678	0.00643	0.00610	0.00580	0.00552
4	0.01343	0.01267	0.01197	0.01134	0.01075	0.01020	0.00970	0.00923
5	0.02025	0.01911	0.01805	0.01708	0.01619	0.01537	0.01461	0.01390
6	0.02855	0.02692	0.02543	0.02405	0.02279	0.02163	0.02055	0.01955
7	0.03835	0.03615	0.03413	0.03228	0.03058	0.02900	0.02755	0.02621
8	0.04974	0.04686	0.04422	0.04180	0.03958	0.03754	0.03564	0.03389

M \ N	33	34	35	36	37	38	39	40
9	0.06277	0.05910	0.05575	0.05268	0.04986	0.04726	0.04486	0.04265
10	0.07755	0.07297	0.06879	0.06496	0.06146	0.05823	0.05525	0.05250
11	0.09416	0.08854	0.08341	0.07873	0.07444	0.07049	0.06686	0.06350
12	0.11273	0.10591	0.09971	0.09405	0.08887	0.08412	0.07974	0.07571
13	0.13340	0.12522	0.11780	0.11103	0.10485	0.09918	0.09396	0.08916
14	0.15634	0.14661	0.13779	0.12977	0.12245	0.11575	0.10960	0.10394
15	0.18174	0.17024	0.15984	0.15040	0.14180	0.13394	0.12673	0.12011
16	0.20982	0.19630	0.18410	0.17305	0.16301	0.15385	0.14546	0.13777

M \ N	33	34	35	36	37	38	39	40
17	0.24088	0.22504	0.21079	0.19791	0.18624	0.17561	0.16590	0.15700
18	0.27523	0.25672	0.24012	0.22518	0.21165	0.19937	0.18817	0.17793
19	0.31328	0.29168	0.27239	0.25507	0.23945	0.22530	0.21243	0.20068
20	0.35552	0.33033	0.30793	0.28789	0.26987	0.25360	0.23885	0.22541
21	0.40256	0.37315	0.34713	0.32396	0.30320	0.28452	0.26762	0.25228
22	0.45517	0.42077	0.39050	0.36369	0.33977	0.31833	0.29900	0.28150
23	0.51433	0.47393	0.43865	0.40757	0.37999	0.35537	0.33326	0.31332
24	0.58132	0.53364	0.49234	0.45622	0.42435	0.39605	0.37075	0.34801

M \ N	33	34	35	36	37	38	39	40
25	0.65787	0.60118	0.55257	0.51041	0.47348	0.44086	0.41186	0.38591
26	0.74637	0.67828	0.62063	0.57113	0.52813	0.49043	0.45711	0.42743
27	0.85024	0.76732	0.69824	0.63967	0.58932	0.54553	0.50710	0.47308
28	0.97464	0.87174	0.78779	0.71776	0.65832	0.60715	0.56262	0.52348
29	1.12791	0.99670	0.89272	0.80780	0.73687	0.67659	0.62465	0.57939
30	1.32469	1.15053	1.01821	0.91322	0.82737	0.75558	0.69450	0.64182
31	1.59456	1.34791	1.17258	1.03921	0.93325	0.84651	0.77390	0.71206
32	2.01219	1.61843	1.37053	1.19410	1.05971	0.95284	0.86525	0.79185

M \ N	33	34	35	36	37	38	39	40
33	2.88108	2.03680	1.64167	1.39259	1.21509	1.07975	0.97200	0.88360
34		2.90666	2.06075	1.66431	1.41410	1.23560	1.09934	0.99075
35			2.93154	2.08407	1.68639	1.43510	1.25564	1.11851
36				2.95576	2.10679	1.70792	1.45562	1.27523
37					2.97934	2.12895	1.72895	1.47566
38						3.00232	2.15057	1.74949
39							3.02474	2.17168
40								3.04661

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=1.0

M \ N	1	2	3	4	5	6	7	8
1	1.00000	0.50000	0.33333	0.25000	0.20000	0.16667	0.14286	0.12500
2		1.50000	0.83333	0.58333	0.45000	0.36667	0.30952	0.26786
3			1.83333	1.08333	0.78333	0.61667	0.50952	0.43452
4				2.08333	1.28333	0.95000	0.75952	0.63452
5					2.28333	1.45000	1.09286	0.88452
6						2.45000	1.59286	1.21786
7							2.59286	1.71786
8								2.71786

M \ N	9	10	11	12	13	14	15	16
1	0.11111	0.10000	0.09091	0.08333	0.07692	0.07143	0.06667	0.06250
2	0.23611	0.21111	0.19091	0.17424	0.16026	0.14835	0.13810	0.12917
3	0.37897	0.33611	0.30202	0.27424	0.25117	0.23168	0.21502	0.20060
4	0.54563	0.47897	0.42702	0.38535	0.35117	0.32259	0.29835	0.27752
5	0.74563	0.64563	0.56988	0.51035	0.46228	0.42259	0.38926	0.36085
6	0.99563	0.84563	0.73654	0.65321	0.58728	0.53371	0.48926	0.45176
7	1.32897	1.09563	0.93654	0.81988	0.73013	0.65871	0.60037	0.55176
8	1.82897	1.42897	1.18654	1.01988	0.89680	0.80156	0.72537	0.66287

M \ N	9	10	11	12	13	14	15	16
9	2.82897	1.92897	1.51988	1.26988	1.09680	0.96823	0.86823	0.78787
10		2.92897	2.01988	1.60321	1.34680	1.16823	1.03490	0.93073
11			3.01988	2.10321	1.68013	1.41823	1.23490	1.09740
12				3.10321	2.18013	1.75156	1.48490	1.29740
13					3.18013	2.25156	1.81823	1.54740
14						3.25156	2.31823	1.88073
15							3.31823	2.38073
16								3.38073

M \ N	17	18	19	20	21	22	23	24
1	0.05882	0.05556	0.05263	0.05000	0.04762	0.04545	0.04348	0.04167
2	0.12132	0.11438	0.10819	0.10263	0.09762	0.09307	0.08893	0.08514
3	0.18799	0.17688	0.16701	0.15819	0.15025	0.14307	0.13655	0.13060
4	0.25942	0.24355	0.22951	0.21701	0.20581	0.19571	0.18655	0.17822
5	0.33634	0.31497	0.29618	0.27951	0.26463	0.25126	0.23918	0.22822
6	0.41968	0.39190	0.36761	0.34618	0.32713	0.31008	0.29474	0.28085
7	0.51058	0.47523	0.44453	0.41761	0.39380	0.37258	0.35356	0.33641
8	0.61058	0.56614	0.52786	0.49453	0.46522	0.43925	0.41606	0.39523

M \ N	17	18	19	20	21	22	23	24
9	0.72170	0.66614	0.61877	0.57786	0.54215	0.51068	0.48273	0.45773
10	0.84670	0.77725	0.71877	0.66877	0.62548	0.58760	0.55416	0.52440
11	0.98955	0.90225	0.82988	0.76877	0.71639	0.67094	0.63108	0.59582
12	1.15622	1.04511	0.95488	0.87988	0.81639	0.76184	0.71441	0.67275
13	1.35622	1.21177	1.09774	1.00488	0.92750	0.86184	0.80532	0.75608
14	1.60622	1.41177	1.26441	1.14774	1.05250	0.97296	0.90532	0.84699
15	1.93955	1.66177	1.46441	1.31441	1.19536	1.09796	1.01643	0.94699
16	2.43955	1.99511	1.71441	1.51441	1.36203	1.24081	1.14143	1.05810

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=1.0

M \ N	17	18	19	20	21	22	23	24
17	3.43955	2.49511	2.04774	1.76441	1.56203	1.40748	1.28429	1.18310
18		3.49511	2.54774	2.09774	1.81203	1.60748	1.45096	1.32596
19			3.54774	2.59774	2.14536	1.85748	1.65096	1.49262
20				3.59774	2.64536	2.19081	1.90096	1.69262
21					3.64536	2.69081	2.23429	1.94262
22						3.69081	2.73429	2.27596
23							3.73429	2.77596
24								3.77596

M \ N	25	26	27	28	29	30	31	32
1	0.04000	0.03846	0.03704	0.03571	0.03448	0.03333	0.03226	0.03125
2	0.08167	0.07846	0.07550	0.07275	0.07020	0.06782	0.06559	0.06351
3	0.12514	0.12013	0.11550	0.11121	0.10723	0.10353	0.10007	0.09684
4	0.17060	0.16361	0.15717	0.15121	0.14570	0.14057	0.13579	0.13132
5	0.21822	0.20906	0.20064	0.19288	0.18570	0.17903	0.17283	0.16704
6	0.26822	0.25668	0.24610	0.23636	0.22736	0.21903	0.21129	0.20408
7	0.32085	0.30668	0.29372	0.28181	0.27084	0.26070	0.25129	0.24254
8	0.37641	0.35931	0.34372	0.32943	0.31630	0.30417	0.29295	0.28254

M \ N	25	26	27	28	29	30	31	32
9	0.43523	0.41487	0.39635	0.37943	0.36391	0.34963	0.33643	0.32420
10	0.49773	0.47369	0.45190	0.43206	0.41391	0.39725	0.38189	0.36768
11	0.56440	0.53619	0.51073	0.48762	0.46655	0.44725	0.42951	0.41314
12	0.63582	0.60286	0.57323	0.54644	0.52210	0.49988	0.47951	0.46076
13	0.71275	0.67429	0.63989	0.60894	0.58092	0.55543	0.53214	0.51076
14	0.79608	0.75121	0.71132	0.67561	0.64342	0.61426	0.58769	0.56339
15	0.88699	0.83454	0.78825	0.74704	0.71009	0.67676	0.64652	0.61894
16	0.98699	0.92545	0.87158	0.82396	0.78152	0.74342	0.70902	0.67777

M \ N	25	26	27	28	29	30	31	32
17	1.09810	1.02545	0.96249	0.90729	0.85844	0.81485	0.77568	0.74027
18	1.22310	1.13656	1.06249	0.99820	0.94178	0.89178	0.84711	0.80693
19	1.36596	1.26156	1.17360	1.09820	1.03269	0.97511	0.92403	0.87836
20	1.53262	1.40442	1.29860	1.20931	1.13269	1.06602	1.00737	0.95528
21	1.73262	1.57109	1.44146	1.33431	1.24380	1.16602	1.09828	1.03862
22	1.98262	1.77109	1.60812	1.47717	1.36880	1.27713	1.19828	1.12953
23	2.31596	2.02109	1.80812	1.64384	1.51165	1.40213	1.30939	1.22953
24	2.81596	2.35442	2.05812	1.84384	1.67832	1.54499	1.43439	1.34064

M \ N	25	26	27	28	29	30	31	32
25	3.81596	2.85442	2.39146	2.09384	1.87832	1.71165	1.57725	1.46564
26		3.85442	2.89146	2.42717	2.12832	1.91165	1.74391	1.60850
27			3.89146	2.92717	2.46165	2.16165	1.94391	1.77516
28				3.92717	2.96165	2.49499	2.19391	1.97516
29					3.96165	2.99499	2.52725	2.22516
30						3.99499	3.02725	2.55850
31							4.02725	3.05850
32								4.05850

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=1.0

M \ N	33	34	35	36	37	38	39	40
1	0.03030	0.02941	0.02857	0.02778	0.02703	0.02632	0.02564	0.02500
2	0.06155	0.05971	0.05798	0.05635	0.05480	0.05334	0.05196	0.05064
3	0.09381	0.09096	0.08829	0.08576	0.08338	0.08112	0.07898	0.07696
4	0.12714	0.12322	0.11954	0.11606	0.11279	0.10969	0.10676	0.10398
5	0.16163	0.15656	0.15179	0.14731	0.14309	0.13910	0.13533	0.13176
6	0.19734	0.19104	0.18513	0.17957	0.17434	0.16941	0.16474	0.16033
7	0.23438	0.22675	0.21961	0.21291	0.20660	0.20066	0.19505	0.18974
8	0.27284	0.26379	0.25532	0.24739	0.23993	0.23291	0.22630	0.22005

M \ N	33	34	35	36	37	38	39	40
9	0.31284	0.30225	0.29236	0.28310	0.27442	0.26625	0.25856	0.25130
10	0.35451	0.34225	0.33082	0.32014	0.31013	0.30073	0.29189	0.28356
11	0.39798	0.38392	0.37082	0.35860	0.34717	0.33645	0.32637	0.31689
12	0.44344	0.42740	0.41249	0.39860	0.38563	0.37348	0.36209	0.35137
13	0.49106	0.47285	0.45597	0.44027	0.42563	0.41194	0.39912	0.38709
14	0.54106	0.52047	0.50142	0.48375	0.46729	0.45194	0.43758	0.42412
15	0.59369	0.57047	0.54904	0.52920	0.51077	0.49361	0.47758	0.46258
16	0.64925	0.62310	0.59904	0.57682	0.55623	0.53709	0.51925	0.50258

M \ N	33	34	35	36	37	38	39	40
17	0.70807	0.67866	0.65167	0.62682	0.60385	0.58254	0.56273	0.54425
18	0.77057	0.73748	0.70723	0.67945	0.65385	0.63016	0.60818	0.58773
19	0.83724	0.79998	0.76605	0.73501	0.70648	0.68016	0.65580	0.63318
20	0.90866	0.86665	0.82855	0.79383	0.76203	0.73279	0.70580	0.68080
21	0.98559	0.93808	0.89522	0.85633	0.82086	0.78835	0.75843	0.73080
22	1.06892	1.01500	0.96665	0.92300	0.88336	0.84717	0.81399	0.78343
23	1.15983	1.09833	1.04357	0.99443	0.95002	0.90967	0.87281	0.83899
24	1.25983	1.18924	1.12690	1.07135	1.02145	0.97634	0.93531	0.89781

M \ N	33	34	35	36	37	38	39	40
25	1.37094	1.28924	1.21781	1.15468	1.09838	1.04777	1.00198	0.96031
26	1.49594	1.40035	1.31781	1.24559	1.18171	1.12469	1.07341	1.02698
27	1.63880	1.52535	1.42892	1.34559	1.27262	1.20802	1.15033	1.09841
28	1.80546	1.66821	1.55392	1.45670	1.37262	1.29893	1.23367	1.17533
29	2.00546	1.83488	1.69678	1.58170	1.48373	1.39893	1.32457	1.25867
30	2.25546	2.03488	1.86345	1.72456	1.60873	1.51004	1.42457	1.34957
31	2.58880	2.28488	2.06345	1.89123	1.75159	1.63504	1.53569	1.44957
32	3.08880	2.61821	2.31345	2.09123	1.91825	1.77790	1.66069	1.56069

M \ N	33	34	35	36	37	38	39	40
33	4.08880	3.11821	2.64678	2.34123	2.11825	1.94457	1.80354	1.68569
34		4.11821	3.14678	2.67456	2.36825	2.14457	1.97021	1.82854
35			4.14678	3.17456	2.70159	2.39457	2.17021	1.99521
36				4.17456	3.20159	2.72790	2.42021	2.19521
37					4.20159	3.22790	2.75354	2.44521
38						4.22790	3.25354	2.77854
39							4.25354	3.27854
40								4.27854

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=1.5

M \ N	1	2	3	4	5	6	7	8
1	1.50000	0.86338	0.63154	0.50801	0.43003	0.37579	0.33559	0.30445
2		2.13662	1.32706	1.00214	0.81991	0.70125	0.61697	0.55359
3			2.54140	1.65198	1.27548	1.05725	0.91195	0.80711
4				2.83787	1.90298	1.49371	1.25099	1.08669
5					3.07159	2.10762	1.67575	1.41528
6						3.26439	2.28037	1.83203
7							3.42839	2.42981
8								3.57104

M \ N	9	10	11	12	13	14	15	16
1	0.27951	0.25902	0.24185	0.22722	0.21458	0.20354	0.19379	0.18511
2	0.50395	0.46386	0.43073	0.40280	0.37891	0.35819	0.34003	0.32397
3	0.72732	0.66427	0.61299	0.57034	0.53423	0.50321	0.47622	0.45250
4	0.96667	0.87446	0.80102	0.74093	0.69070	0.64799	0.61116	0.57902
5	1.23672	1.10498	1.00297	0.92121	0.85394	0.79747	0.74927	0.70757
6	1.55813	1.36846	1.22739	1.11744	1.02883	0.95560	0.89387	0.84101
7	1.96898	1.68458	1.48602	1.33735	1.22082	1.12647	1.04819	0.98197
8	2.56148	2.09087	1.79804	1.59221	1.43723	1.31517	1.21594	1.13332

M \ N	9	10	11	12	13	14	15	16
9	3.69724	2.67913	2.20068	1.90095	1.68907	1.52877	1.40200	1.29857
10		3.81036	2.78546	2.30059	1.99512	1.77813	1.61328	1.48244
11			3.91285	2.88243	2.39224	2.08191	1.86056	1.69178
12				4.00653	2.97155	2.47687	2.16240	1.93728
13					4.09278	3.05400	2.55549	2.23744
14						4.17268	3.13069	2.62889
15							4.24711	3.20238
16								4.31676

M \ N	17	18	19	20	21	22	23	24
1	0.17732	0.17030	0.16392	0.15810	0.15276	0.14785	0.14330	0.13909
2	0.30963	0.29676	0.28511	0.27453	0.26486	0.25598	0.24779	0.24022
3	0.43146	0.41265	0.39572	0.38038	0.36642	0.35364	0.34190	0.33107
4	0.55069	0.52551	0.50295	0.48261	0.46416	0.44733	0.43191	0.41773
5	0.67108	0.63884	0.61011	0.58433	0.56103	0.53988	0.52056	0.50283
6	0.79514	0.75491	0.71927	0.68746	0.65886	0.63298	0.60943	0.58790
7	0.92510	0.87562	0.83211	0.79350	0.75897	0.72787	0.69969	0.67401
8	1.06322	1.00285	0.95020	0.90381	0.86257	0.82561	0.79228	0.76204

M \ N	17	18	19	20	21	22	23	24
9	1.21218	1.13869	1.07524	1.01979	0.97083	0.92724	0.88811	0.85277
10	1.37536	1.28567	1.20918	1.14301	1.08506	1.03381	0.98809	0.94701
11	1.55740	1.44711	1.35451	1.27536	1.20675	1.14656	1.09324	1.04561
12	1.76508	1.62759	1.51446	1.41926	1.33774	1.26693	1.20472	1.14953
13	2.00903	1.83382	1.69358	1.57793	1.48041	1.39674	1.32396	1.25992
14	2.30772	2.07642	1.89855	1.75585	1.63794	1.53833	1.45273	1.37815
15	2.69771	2.37380	2.13995	1.95970	1.81481	1.69486	1.59336	1.50600
16	3.26967	2.76249	2.43617	2.20003	2.01766	1.87078	1.74899	1.64577

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=1.5

M \ N	17	18	19	20	21	22	23	24
17	4.36220	3.33307	2.82368	2.49520	2.25703	2.07273	1.92407	1.80060
18		4.44392	3.39300	2.88164	2.55124	2.31123	2.12520	1.97491
19			4.50230	3.44981	2.93671	2.60457	2.36290	2.17530
20				4.55769	3.50382	2.98915	2.65545	2.41227
21					4.61039	3.55529	3.03921	2.70409
22						4.66063	3.60444	3.08708
23							4.70864	3.65148
24								4.75460

M \ N	25	26	27	28	29	30	31	32
1	0.13517	0.13151	0.12808	0.12487	0.12185	0.11900	0.11632	0.11377
2	0.23320	0.22665	0.22054	0.21482	0.20945	0.20440	0.19964	0.19514
3	0.32104	0.31172	0.30304	0.29492	0.28732	0.28018	0.27346	0.26712
4	0.40463	0.39249	0.38120	0.37067	0.36082	0.35158	0.34291	0.33474
5	0.48651	0.47141	0.45741	0.44438	0.43221	0.42083	0.41015	0.40011
6	0.56813	0.54990	0.53303	0.51736	0.50277	0.48913	0.47637	0.46438
7	0.65051	0.62890	0.60896	0.59048	0.57330	0.55729	0.54233	0.52830
8	0.73445	0.70916	0.68589	0.66439	0.64445	0.62591	0.60860	0.59242

M \ N	25	26	27	28	29	30	31	32
9	0.82066	0.79134	0.76444	0.73965	0.71672	0.69545	0.67565	0.65716
10	0.90985	0.87605	0.84515	0.81676	0.79059	0.76636	0.74386	0.72290
11	1.00275	0.96393	0.92859	0.89624	0.86650	0.83905	0.81362	0.78998
12	1.10016	1.05568	1.01535	0.97858	0.94490	0.91391	0.88528	0.85874
13	1.20302	1.15206	1.10609	1.06437	1.02630	0.99139	0.95924	0.92952
14	1.31244	1.25398	1.20156	1.15423	1.11123	1.07195	1.03590	1.00268
15	1.42978	1.36254	1.30265	1.24890	1.20030	1.15611	1.11572	1.07862
16	1.55681	1.47910	1.41045	1.34925	1.29425	1.24449	1.19920	1.15777

M \ N	25	26	27	28	29	30	31	32
17	1.69581	1.60539	1.52629	1.45635	1.39393	1.33779	1.28695	1.24064
18	1.84991	1.74369	1.65191	1.57155	1.50041	1.43687	1.37966	1.32781
19	2.02352	1.89712	1.78958	1.69656	1.61502	1.54278	1.47818	1.41998
20	2.22323	2.07009	1.94240	1.83364	1.73947	1.65685	1.58357	1.51800
21	2.45953	2.26918	2.11478	1.98590	1.87602	1.78078	1.69715	1.62291
22	2.75067	2.50486	2.31329	2.15774	2.02776	1.91684	1.82061	1.73603
23	3.13295	2.79536	2.54839	2.35571	2.19909	2.06810	1.95620	1.85905
24	3.69657	3.17699	2.83832	2.59028	2.39657	2.23896	2.10702	1.99422

M \ N	25	26	27	28	29	30	31	32
25	4.79869	3.73986	3.21932	2.87965	2.63064	2.43597	2.27744	2.14462
26		4.84104	3.78151	3.26008	2.91950	2.66957	2.47402	2.31463
27			4.88179	3.82162	3.29938	2.95795	2.70718	2.51080
28				4.92106	3.86030	3.33732	2.99510	2.74354
29					4.95894	3.89766	3.37398	3.03104
30						4.99554	3.93377	3.40946
31							5.03093	3.96873
32								5.06519

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=1.5

M \ N	33	34	35	36	37	38	39	40
1	0.11136	0.10908	0.10690	0.10483	0.10286	0.10097	0.09917	0.09745
2	0.19088	0.18685	0.18301	0.17937	0.17590	0.17259	0.16943	0.16641
3	0.26112	0.25545	0.25007	0.24496	0.24010	0.23547	0.23106	0.22684
4	0.32703	0.31973	0.31283	0.30628	0.30005	0.29413	0.28848	0.28309
5	0.39064	0.38171	0.37325	0.36524	0.35764	0.35041	0.34353	0.33697
6	0.45310	0.44247	0.43243	0.42292	0.41390	0.40535	0.39720	0.38945
7	0.51513	0.50272	0.49102	0.47996	0.46949	0.45955	0.45012	0.44114
8	0.57724	0.56297	0.54953	0.53685	0.52485	0.51348	0.50270	0.49245

M \ N	33	34	35	36	37	38	39	40
9	0.63985	0.62361	0.60833	0.59394	0.58034	0.56747	0.55528	0.54370
10	0.70331	0.68497	0.66774	0.65153	0.63624	0.62179	0.60812	0.59515
11	0.76794	0.74734	0.72803	0.70989	0.69281	0.67669	0.66145	0.64702
12	0.83405	0.81102	0.78947	0.76926	0.75027	0.73237	0.71548	0.69950
13	0.90194	0.87628	0.85232	0.82989	0.80884	0.78904	0.77038	0.75276
14	0.97194	0.94341	0.91683	0.89200	0.86874	0.84691	0.82636	0.80699
15	1.04440	1.01271	0.98328	0.95584	0.93020	0.90617	0.88360	0.86235
16	1.11968	1.08453	1.05196	1.02168	0.99345	0.96704	0.94229	0.91902

M \ N	33	34	35	36	37	38	39	40
17	1.19823	1.15923	1.12321	1.08981	1.05874	1.02975	1.00263	0.97719
18	1.28054	1.23724	1.19737	1.16053	1.12636	1.09455	1.06485	1.03705
19	1.36720	1.31904	1.27489	1.23422	1.19661	1.16170	1.12919	1.09883
20	1.45888	1.40521	1.35622	1.31127	1.26985	1.23152	1.19592	1.16275
21	1.55644	1.49645	1.44196	1.39218	1.34649	1.30435	1.26533	1.22908
22	1.66090	1.59357	1.53277	1.47751	1.42700	1.38060	1.33779	1.29813
23	1.77359	1.69763	1.62950	1.56794	1.51195	1.46074	1.41368	1.37023
24	1.89620	1.80993	1.73317	1.66430	1.60202	1.54534	1.49348	1.44579

M \ N	33	34	35	36	37	38	39	40
25	2.03098	1.93215	1.84510	1.76761	1.69803	1.63508	1.57776	1.52528
26	2.18099	2.06655	1.96697	1.87920	1.80101	1.73077	1.66717	1.60924
27	2.35062	2.21620	2.10102	2.00073	1.91227	1.83344	1.76256	1.69837
28	2.54639	2.38546	2.25033	2.13445	2.03349	1.94439	1.86494	1.79347
29	2.77875	2.58088	2.41925	2.28343	2.16691	2.06531	1.97561	1.89557
30	3.06583	2.81286	2.61432	2.45203	2.31558	2.19843	2.09625	2.00597
31	3.44382	3.09956	2.84595	2.64678	2.48387	2.34682	2.22909	2.12634
32	4.00259	3.47714	3.13229	2.87808	2.67831	2.51482	2.37720	2.25892

M \ N	33	34	35	36	37	38	39	40
33	5.09840	4.03543	3.50947	3.16407	2.90929	2.70896	2.54492	2.40677
34		5.13061	4.06731	3.54087	3.19495	2.93964	2.73879	2.57423
35			5.16188	4.09827	3.57139	3.22498	2.96918	2.76783
36				5.19227	4.12838	3.60108	3.25422	2.99794
37					5.22183	4.15768	3.62999	3.28269
38						5.25059	4.18620	3.65815
39							5.27860	4.21399
40								5.30589

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=2.0

M \ N	1	2	3	4	5	6	7	8
1	2.00000	1.25000	0.96296	0.80469	0.70208	0.62912	0.57402	0.53063
2		2.75000	1.82407	1.43779	1.21512	1.06690	0.95969	0.87777
3			3.21296	2.21036	1.77180	1.51154	1.33494	1.20545
4				3.54716	2.50273	2.03205	1.74701	1.55077
5					3.80827	2.73808	2.24583	1.94325
6						4.02231	2.93497	2.42737
7							4.20353	3.10417
8								4.36058

M \ N	9	10	11	12	13	14	15	16
1	0.49537	0.46602	0.44112	0.41967	0.40095	0.38443	0.36972	0.35652
2	0.81270	0.75949	0.71499	0.67710	0.64435	0.61570	0.59037	0.56779
3	1.10551	1.02553	0.95974	0.90446	0.85721	0.81624	0.78032	0.74849
4	1.40532	1.29214	1.20097	1.12558	1.06197	1.00740	0.95996	0.91824
5	1.73259	1.57509	1.45169	1.35173	1.26871	1.19839	1.13787	1.08511
6	2.11178	1.89009	1.72316	1.59163	1.48457	1.39530	1.31942	1.25394
7	2.58517	2.25957	2.02920	1.85470	1.71653	1.60360	1.50911	1.42856
8	3.25246	2.72471	2.39122	2.15384	1.97314	1.82945	1.71160	1.61268

M \ N	9	10	11	12	13	14	15	16
9	4.49910	3.38440	2.84977	2.50991	2.26678	2.08091	1.93257	1.81052
10		4.62296	3.50321	2.96306	2.61797	2.37004	2.17980	2.02749
11			4.73493	3.61124	3.06658	2.71714	2.46515	2.27119
12				4.83708	3.71027	3.16189	2.80877	2.55332
13					4.93099	3.80166	3.25016	2.89392
14						5.01786	3.88651	3.33237
15							5.09867	3.96567
16								5.17420

M \ N	17	18	19	20	21	22	23	24
1	0.34458	0.33373	0.32380	0.31468	0.30626	0.29846	0.29121	0.28445
2	0.54748	0.52911	0.51239	0.49709	0.48302	0.47003	0.45799	0.44679
3	0.72005	0.69445	0.67125	0.65011	0.63074	0.61293	0.59646	0.58119
4	0.88121	0.84805	0.81816	0.79104	0.76629	0.74360	0.72270	0.70337
5	1.03861	0.99724	0.96015	0.92665	0.89622	0.86841	0.84289	0.81935
6	1.19671	1.14616	1.10111	1.06064	1.02404	0.99075	0.96030	0.93231
7	1.35886	1.29781	1.24378	1.19554	1.15214	1.11283	1.07703	1.04425
8	1.52813	1.45480	1.39043	1.33337	1.28233	1.23636	1.19466	1.15664

M \ N	17	18	19	20	21	22	23	24
9	1.70780	1.61979	1.54330	1.47603	1.41630	1.36279	1.31453	1.27071
10	1.90183	1.79581	1.70477	1.62551	1.55568	1.49357	1.43787	1.38756
11	2.11545	1.98665	1.87774	1.78404	1.70231	1.63021	1.56599	1.50831
12	2.35613	2.19742	2.06586	1.95440	1.85834	1.77442	1.70027	1.63414
13	2.63548	2.43549	2.27416	2.14017	2.02644	1.92827	1.84239	1.76640
14	2.97344	2.71240	2.50995	2.34631	2.21015	2.09440	1.99434	1.90668
15	3.40929	3.04802	2.78471	2.58008	2.41438	2.27630	2.15873	2.05696
16	4.03985	3.48154	3.11824	2.85292	2.64636	2.47883	2.33900	2.21979

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=2.0

M \ N	17	18	19	20	21	22	23	24
17	5.24510	4.10964	3.54966	3.18457	2.91747	2.70918	2.54000	2.39860
18		5.31189	4.17552	3.61409	3.24742	2.97873	2.76889	2.59822
19			5.37502	4.23791	3.67520	3.30713	3.03701	2.82579
20				5.43487	4.29714	3.73332	3.36399	3.09260
21					5.49175	4.35352	3.78872	3.41827
22						5.54596	4.40731	3.84164
23							5.59771	4.45873
24								5.64723

M \ N	25	26	27	28	29	30	31	32
1	0.27812	0.27218	0.26660	0.26133	0.25636	0.25165	0.24718	0.24294
2	0.43634	0.42656	0.41738	0.40875	0.40061	0.39292	0.38564	0.37873
3	0.56697	0.55370	0.54128	0.52961	0.51864	0.50829	0.49850	0.48924
4	0.68542	0.66871	0.65310	0.63847	0.62474	0.61181	0.59961	0.58807
5	0.79757	0.77734	0.75848	0.74085	0.72432	0.70880	0.69417	0.68036
6	0.90649	0.88256	0.86032	0.83957	0.82017	0.80196	0.78485	0.76873
7	1.01410	0.98624	0.96041	0.93638	0.91396	0.89297	0.87327	0.85473
8	1.12179	1.08970	1.06003	1.03250	1.00687	0.98293	0.96051	0.93945

M \ N	25	26	27	28	29	30	31	32
9	1.23070	1.19399	1.16016	1.12886	1.09979	1.07270	1.04739	1.02367
10	1.34183	1.30004	1.26165	1.22625	1.19346	1.16299	1.13458	1.10801
11	1.45616	1.40870	1.36529	1.32538	1.28855	1.25440	1.22265	1.19303
12	1.57469	1.52087	1.47185	1.42696	1.38567	1.34752	1.31213	1.27921
13	1.69855	1.63748	1.58214	1.53170	1.48546	1.44289	1.40354	1.36701
14	1.82903	1.75962	1.69708	1.64036	1.58860	1.54113	1.49739	1.45692
15	1.96769	1.88853	1.81769	1.75381	1.69581	1.64285	1.59424	1.54942
16	2.11647	2.02574	1.94520	1.87306	1.80794	1.74877	1.69470	1.64504

M \ N	25	26	27	28	29	30	31	32
17	2.27791	2.17318	2.08111	1.99931	1.92597	1.85971	1.79946	1.74437
18	2.45540	2.33335	2.22733	2.13404	2.05108	1.97663	1.90933	1.84808
19	2.65376	2.50965	2.38636	2.27916	2.18475	2.10071	2.02524	1.95696
20	2.86011	2.70686	2.56156	2.43713	2.32885	2.23340	2.14837	2.07196
21	3.14572	2.93208	2.75771	2.61133	2.48586	2.37658	2.28017	2.19422
22	3.47018	3.19659	2.98190	2.80651	2.65913	2.53270	2.42249	2.32519
23	3.89229	3.51993	3.24538	3.02974	2.85340	2.70510	2.57778	2.46672
24	4.50799	3.94086	3.56768	3.29226	3.07574	2.89853	2.74939	2.62124

M \ N	25	26	27	28	29	30	31	32
25	5.69470	4.55525	3.98751	3.61358	3.33737	3.12004	2.94203	2.79210
26		5.74028	4.60067	4.03238	3.65777	3.38083	3.16276	2.98402
27			5.78411	4.64439	4.07560	3.70038	3.42277	3.20401
28				5.82632	4.68652	4.11730	3.74150	3.46328
29					5.86703	4.72718	4.15756	3.78125
30						5.90634	4.76646	4.19649
31							5.94433	4.80446
32								5.98110

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=2.0

M \ N	33	34	35	36	37	38	39	40
1	0.23890	0.23505	0.23138	0.22787	0.22450	0.22128	0.21819	0.21523
2	0.37217	0.36592	0.35997	0.35429	0.34886	0.34366	0.33868	0.33390
3	0.48045	0.47209	0.46414	0.45656	0.44932	0.44241	0.43579	0.42944
4	0.57714	0.56677	0.55691	0.54752	0.53857	0.53003	0.52186	0.51403
5	0.66730	0.65493	0.64318	0.63200	0.62136	0.61122	0.60152	0.59225
6	0.75350	0.73908	0.72542	0.71245	0.70010	0.68834	0.67713	0.66641
7	0.83726	0.82075	0.80512	0.79030	0.77622	0.76282	0.75005	0.73786
8	0.91963	0.90094	0.88327	0.86653	0.85065	0.83556	0.82120	0.80750

M \ N	33	34	35	36	37	38	39	40
9	1.00138	0.98039	0.96058	0.94185	0.92410	0.90725	0.89123	0.87598
10	1.08310	1.05968	1.03762	1.01678	0.99707	0.97839	0.96064	0.94377
11	1.16531	1.13931	1.11485	1.09179	1.07001	1.04939	1.02984	1.01127
12	1.24847	1.21969	1.19267	1.16725	1.14327	1.12061	1.09916	1.07880
13	1.33300	1.30123	1.27147	1.24352	1.21720	1.19237	1.16889	1.14665
14	1.41934	1.38432	1.35160	1.32092	1.29210	1.26495	1.23932	1.21508
15	1.50792	1.46936	1.43341	1.39980	1.36827	1.33864	1.31071	1.28434
16	1.59921	1.55676	1.51729	1.48048	1.44603	1.41372	1.38332	1.35467

M \ N	33	34	35	36	37	38	39	40
17	1.69372	1.64697	1.60363	1.56332	1.52569	1.49047	1.45741	1.42630
18	1.79203	1.74048	1.69286	1.64869	1.60758	1.56920	1.53325	1.49949
19	1.89479	1.83785	1.78545	1.73702	1.69208	1.65023	1.61114	1.57451
20	2.00278	1.93974	1.88197	1.82879	1.77960	1.73393	1.69139	1.65162
21	2.11693	2.04690	1.98306	1.92452	1.87060	1.82070	1.77435	1.73115
22	2.23839	2.16028	2.08947	2.02487	1.96561	1.91099	1.86043	1.81344
23	2.36859	2.28099	2.20212	2.13057	2.06527	2.00534	1.95006	1.89887
24	2.50938	2.41048	2.32214	2.24256	2.17032	2.10436	2.04379	1.98790

M \ N	33	34	35	36	37	38	39	40
25	2.66319	2.55059	2.45097	2.36194	2.28168	2.20880	2.14222	2.08104
26	2.83335	2.70373	2.59043	2.49015	2.40046	2.31958	2.24609	2.17892
27	3.02458	2.87324	2.74295	2.62900	2.52809	2.43780	2.35632	2.28226
28	3.24389	3.06381	2.91184	2.78093	2.66638	2.56487	2.47401	2.39197
29	3.50246	3.28248	3.10181	2.94924	2.81776	2.70263	2.60057	2.50917
30	3.81970	3.54039	3.31986	3.13863	2.98552	2.85348	2.73783	2.63524
31	4.23417	3.85695	3.57714	3.35610	3.17436	3.02073	2.88818	2.77202
32	4.84125	4.27067	3.89305	3.61279	3.39128	3.20905	3.05493	2.92190

M \ N	33	34	35	36	37	38	39	40
33	6.01672	4.87691	4.30607	3.92808	3.64740	3.42544	3.24276	3.08819
34		6.05126	4.91151	4.34044	3.96210	3.68103	3.45866	3.27555
35			6.08478	4.94510	4.37382	3.99517	3.71374	3.49097
36				6.11735	4.97775	4.40627	4.02734	3.74556
37					6.14900	5.00949	4.43785	4.05864
38						6.17980	5.04039	4.46860
39							6.20978	5.07049
40								6.23900

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=2.5

M \ N	1	2	3	4	5	6	7	8
1	2.50000	1.65117	1.31558	1.12646	1.00178	0.91192	0.84327	0.78866
2		3.34883	2.32235	1.88296	1.62514	1.45113	1.32380	1.22554
3			3.86206	2.76175	2.26969	1.97316	1.76947	1.61857
4				4.22883	3.08978	2.56623	2.24475	2.02097
5					4.51360	3.35156	2.80733	2.46853
6						4.74600	3.56925	3.01061
7							4.94213	3.75546
8								5.11165

M \ N	9	10	11	12	13	14	15	16
1	0.74389	0.70633	0.67423	0.64640	0.62195	0.60026	0.58084	0.56332
2	1.14681	1.08193	1.02729	0.98046	0.93975	0.90394	0.87212	0.84361
3	1.50109	1.40632	1.32782	1.26144	1.20436	1.15461	1.11075	1.07172
4	1.85355	1.72221	1.61566	1.52697	1.45170	1.38677	1.33003	1.27991
5	2.23024	2.05054	1.90869	1.79302	1.69635	1.61401	1.54279	1.48041
6	2.65917	2.40994	2.22077	2.07064	1.94768	1.84456	1.75645	1.68004
7	3.18633	2.82531	2.56759	2.37089	2.21409	2.08518	1.97672	1.88380
8	3.91807	3.34105	2.97259	2.70809	2.50529	2.34300	2.20914	2.09619

M \ N	9	10	11	12	13	14	15	16
9	5.26085	4.06233	3.47923	3.10484	2.83484	2.62701	2.46013	2.32209
10		5.39402	4.19191	3.60403	3.22484	2.95030	2.73826	2.56750
11			5.51423	4.30948	3.71778	3.33465	3.05632	2.84071
12				5.62375	4.41706	3.82228	3.43586	3.15432
13					5.72431	4.51620	3.91888	3.52971
14						5.81724	4.60809	4.00869
15							5.90361	4.69372
16								5.98427

M \ N	17	18	19	20	21	22	23	24
1	0.54741	0.53288	0.51954	0.50722	0.49582	0.48521	0.47532	0.46605
2	0.81787	0.79447	0.77309	0.75345	0.73533	0.71854	0.70292	0.68835
3	1.03668	1.00501	0.97620	0.94985	0.92562	0.90325	0.88251	0.86322
4	1.23521	1.19503	1.15866	1.12554	1.09521	1.06730	1.04151	1.01759
5	1.42518	1.37584	1.33142	1.29115	1.25444	1.22079	1.18980	1.16113
6	1.61296	1.55346	1.50021	1.45221	1.40863	1.36886	1.33236	1.29872
7	1.80303	1.73197	1.66882	1.61223	1.56113	1.51470	1.47227	1.43329
8	1.99919	1.91469	1.84021	1.77392	1.71443	1.66063	1.61170	1.56692

M \ N	17	18	19	20	21	22	23	24
9	2.20532	2.10481	2.01709	1.93965	1.87061	1.80856	1.75239	1.70124
10	2.42588	2.30582	2.20228	2.11175	2.03170	1.96024	1.89593	1.83765
11	2.66663	2.52193	2.39901	2.29281	2.19981	2.11745	2.04384	1.97752
12	2.93566	2.75871	2.61133	2.48590	2.37736	2.28216	2.19776	2.12222
13	3.24543	3.02414	2.84469	2.69495	2.56730	2.45668	2.35954	2.27329
14	3.61718	3.33054	3.10696	2.92532	2.77350	2.64389	2.53141	2.43251
15	4.09258	3.69908	3.41040	3.18480	3.00123	2.84756	2.71619	2.60205
16	4.77387	4.17128	3.77606	3.48559	3.25823	3.07294	2.91762	2.78468

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=2.5

M \ N	17	18	19	20	21	22	23	24
17	6.05992	4.84920	4.24538	3.84868	3.55664	3.32772	3.14089	2.98409
18		6.13114	4.92023	4.31539	3.91739	3.62398	3.39365	3.20546
19			6.19841	4.98744	4.38173	3.98259	3.68796	3.45639
20				6.26215	5.05120	4.44475	4.04462	3.74889
21					6.32269	5.11184	4.50477	4.10377
22						6.38035	5.16966	4.56205
23							6.43538	5.22490
24								6.48801

M \ N	25	26	27	28	29	30	31	32
1	0.45736	0.44918	0.44146	0.43416	0.42725	0.42069	0.41445	0.40850
2	0.67471	0.66190	0.64986	0.63849	0.62775	0.61757	0.60791	0.59872
3	0.84521	0.82834	0.81251	0.79760	0.78354	0.77024	0.75764	0.74568
4	0.99531	0.97451	0.95502	0.93672	0.91948	0.90321	0.88783	0.87324
5	1.13452	1.10973	1.08656	1.06485	1.04444	1.02522	1.00707	0.98990
6	1.26758	1.23864	1.21167	1.18645	1.16280	1.14056	1.11960	1.09980
7	1.39733	1.36402	1.33305	1.30415	1.27712	1.25175	1.22789	1.20539
8	1.52576	1.48775	1.45251	1.41973	1.38912	1.36047	1.33356	1.30825

M \ N	25	26	27	28	29	30	31	32
9	1.65439	1.61128	1.57144	1.53448	1.50007	1.46792	1.43781	1.40952
10	1.78452	1.73582	1.69096	1.64948	1.61096	1.57507	1.54153	1.51009
11	1.91735	1.86244	1.81207	1.76564	1.72266	1.68273	1.64551	1.61070
12	2.05409	1.99223	1.93572	1.88383	1.83597	1.79163	1.75042	1.71197
13	2.19603	2.12627	2.06286	2.00490	1.95163	1.90246	1.85689	1.81450
14	2.34461	2.26579	2.19455	2.12975	2.07045	2.01593	1.96557	1.91885
15	2.50157	2.41218	2.33193	2.25935	2.19327	2.13277	2.07709	2.02562
16	2.66903	2.56713	2.47638	2.39484	2.32103	2.25378	2.19216	2.13542

M \ N	25	26	27	28	29	30	31	32
17	2.84973	2.73272	2.62952	2.53753	2.45481	2.37987	2.31155	2.24890
18	3.04733	2.91167	2.79343	2.68904	2.59592	2.51212	2.43614	2.36682
19	3.26695	3.10761	2.97079	2.85143	2.74595	2.65179	2.56699	2.49006
20	3.51621	3.32566	3.16522	3.02734	2.90694	2.80047	2.70535	2.61963
21	3.80707	3.57337	3.38181	3.22038	3.08152	2.96017	2.85279	2.75678
22	4.16028	3.86271	3.62810	3.43562	3.27328	3.13352	3.01131	2.90308
23	4.61684	4.21438	3.91603	3.68059	3.48728	3.32410	3.18352	3.06050
24	5.27777	4.66933	4.26627	3.96721	3.73103	3.53694	3.37299	3.23166

M \ N	25	26	27	28	29	30	31	32
25	6.53844	5.32847	4.71971	4.31612	4.01642	3.77955	3.58476	3.42011
26		6.58684	5.37717	4.76815	4.36407	4.06379	3.82630	3.63086
27			6.63337	5.42402	4.81477	4.41026	4.10946	3.87140
28				6.67816	5.46915	4.85972	4.45483	4.15355
29					6.72133	5.51268	4.90310	4.49787
30						6.76301	5.55472	4.94502
31							6.80329	5.59537
32								6.84225

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=2.5

M \ N	33	34	35	36	37	38	39	40
1	0.40283	0.39741	0.39223	0.38726	0.38250	0.37793	0.37353	0.36930
2	0.58998	0.58163	0.57366	0.56604	0.55873	0.55173	0.54501	0.53854
3	0.73431	0.72348	0.71315	0.70328	0.69384	0.68479	0.67612	0.66779
4	0.85940	0.84623	0.83369	0.82172	0.81028	0.79934	0.78886	0.77881
5	0.97362	0.95816	0.94345	0.92943	0.91606	0.90327	0.89104	0.87932
6	1.08107	1.06330	1.04641	1.03035	1.01503	1.00042	0.98645	0.97307
7	1.18413	1.16399	1.14489	1.12674	1.10946	1.09299	1.07726	1.06222
8	1.28436	1.26178	1.24039	1.22009	1.20080	1.18242	1.16489	1.14816

M \ N	33	34	35	36	37	38	39	40
9	1.38288	1.35775	1.33397	1.31144	1.29005	1.26971	1.25033	1.23184
10	1.48055	1.45271	1.42643	1.40156	1.37799	1.35560	1.33430	1.31400
11	1.57805	1.54735	1.51842	1.49109	1.46521	1.44068	1.41737	1.39519
12	1.67599	1.64223	1.61048	1.58053	1.55224	1.52544	1.50002	1.47585
13	1.77492	1.73788	1.70310	1.67037	1.63949	1.61030	1.58264	1.55639
14	1.87537	1.83477	1.79673	1.76101	1.72737	1.69563	1.66561	1.63715
15	1.97786	1.93338	1.89182	1.85287	1.81627	1.78179	1.74924	1.71845
16	2.08294	2.03421	1.98880	1.94635	1.90655	1.86914	1.83388	1.80057

M \ N	33	34	35	36	37	38	39	40
17	2.19118	2.13776	2.08813	2.04186	1.99859	1.95799	1.91982	1.88383
18	2.30323	2.24459	2.19031	2.13984	2.09277	2.04873	2.00740	1.96851
19	2.41982	2.35534	2.29587	2.24077	2.18953	2.14171	2.09695	2.05492
20	2.54181	2.47072	2.40543	2.34517	2.28931	2.23734	2.18883	2.14339
21	2.67021	2.59157	2.51969	2.45364	2.39264	2.33608	2.28344	2.23426
22	2.80625	2.71889	2.63949	2.56687	2.50011	2.43843	2.38121	2.32793
23	2.95149	2.85391	2.76581	2.68569	2.61239	2.54497	2.48265	2.42481
24	3.10789	2.99816	2.89987	2.81109	2.73031	2.65637	2.58832	2.52540

M \ N	33	34	35	36	37	38	39	40
25	3.27807	3.15362	3.04321	2.94426	2.85484	2.77344	2.69890	2.63027
26	3.46556	3.32287	3.19778	3.08675	2.98719	2.89717	2.81519	2.74008
27	3.67537	3.50946	3.36617	3.24049	3.12887	3.02873	2.93815	2.85563
28	3.91496	3.71838	3.55191	3.40807	3.28183	3.16966	3.06899	2.97789
29	4.19615	3.95708	3.76000	3.59301	3.44865	3.32189	3.20921	3.10804
30	4.53948	4.23737	3.99786	3.80030	3.63284	3.48799	3.36074	3.24758
31	4.96557	4.57976	4.27729	4.03737	3.83938	3.67147	3.52616	3.39846
32	5.63471	5.02484	4.61879	4.31599	4.07569	3.87730	3.70896	3.56323

M \ N	33	34	35	36	37	38	39	40
33	6.87999	5.67283	5.06291	4.65664	4.35354	4.11289	3.91412	3.74540
34		6.91657	5.70979	5.09984	4.69338	4.39000	4.14903	3.94991
35			6.95206	5.74567	5.13571	4.72907	4.42544	4.18416
36				6.98653	5.78053	5.17056	4.76377	4.45991
37					7.02003	5.81441	5.20446	4.79754
38						7.05262	5.84738	5.23746
39							7.08433	5.87949
40								7.11523

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=3.0

M \ N	1	2	3	4	5	6	7	8
1	3.00000	2.06250	1.68313	1.46603	1.32126	1.21592	1.13483	1.06987
2		3.93750	2.82124	2.33441	2.04512	1.84796	1.70251	1.58951
3			4.49563	3.30808	2.76834	2.43945	2.21156	2.04151
4				4.39148	3.66791	3.09724	2.74330	2.49496
5					5.19737	3.95324	3.36269	2.99164
6						5.44619	4.18946	3.58532
7							5.65565	4.39084
8								5.83633

M \ N	9	10	11	12	13	14	15	16
1	1.01630	0.97111	0.93231	0.89851	0.86870	0.84216	0.81831	0.79672
2	1.49843	1.42297	1.35912	1.30415	1.25618	1.21383	1.17606	1.14211
3	1.90830	1.80026	1.71033	1.63394	1.56800	1.51031	1.45928	1.41372
4	2.30794	2.16040	2.04008	1.93949	1.85375	1.77952	1.71443	1.65674
5	2.72874	2.52926	2.37096	2.24125	2.13240	2.03932	1.95852	1.88751
6	3.20195	2.92822	2.71923	2.55255	2.41542	2.29994	2.20091	2.11474
7	3.77701	3.38444	3.10237	2.88591	2.71253	2.56939	2.44848	2.34453
8	4.56622	3.94525	3.54563	3.25699	3.03452	2.85568	2.70756	2.58213

M \ N	9	10	11	12	13	14	15	16
9	5.99510	4.72147	4.09511	3.68995	3.39603	3.16865	2.98528	2.83300
10		6.13661	4.86066	4.23016	3.82058	3.52235	3.29090	3.10373
11			6.26421	4.98676	4.35304	3.93987	3.63807	3.40320
12				6.38034	5.10198	4.46572	4.04961	3.74483
13					6.48687	5.20802	4.56975	4.15121
14						6.58524	5.30622	4.66633
15							6.67660	5.39763
16								6.76186

M \ N	17	18	19	20	21	22	23	24
1	0.77705	0.75904	0.74244	0.72710	0.71285	0.69956	0.68714	0.67548
2	1.11137	1.08335	1.05767	1.03403	1.01215	0.99184	0.97290	0.95520
3	1.37270	1.33551	1.30160	1.27049	1.24183	1.21530	1.19065	1.16767
4	1.60514	1.55862	1.51640	1.47785	1.44247	1.40984	1.37962	1.35152
5	1.82445	1.76795	1.71695	1.67060	1.62824	1.58931	1.55339	1.52009
6	2.03885	1.97134	1.91076	1.85599	1.80616	1.76057	1.71864	1.67991
7	2.25388	2.17388	2.10260	2.03854	1.98056	1.92774	1.87937	1.83484
8	2.47403	2.37958	2.29608	2.22157	2.15451	2.09374	2.03832	1.98751

M \ N	17	18	19	20	21	22	23	24
9	2.70373	2.59211	2.49438	2.40786	2.33053	2.26086	2.19764	2.13994
10	2.94791	2.81536	2.70068	2.60013	2.51097	2.43118	2.35920	2.29382
11	3.21280	3.05395	2.91856	2.80124	2.69821	2.60672	2.52475	2.45072
12	3.50706	3.31388	3.15241	3.01456	2.89491	2.78969	2.69615	2.61224
13	3.84390	3.60364	3.40807	3.24432	3.10429	2.98259	2.87543	2.78006
14	4.24576	3.93631	3.69391	3.49625	3.33049	3.18855	3.06502	2.95613
15	4.75646	4.33418	4.02288	3.77862	3.57913	3.41160	3.26795	3.14280
16	5.48312	4.84091	4.41719	4.10431	3.85841	3.65731	3.48821	3.34304

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=3.0

M \ N	17	18	19	20	21	22	23	24
17	6.84179	5.56340	4.92036	4.49541	4.18115	3.93383	3.73130	3.56079
18		6.91698	5.63905	4.99535	4.56936	4.25389	4.00531	3.80151
19			6.98798	5.71057	5.06635	4.63946	4.32294	4.07324
20				7.05521	5.77839	5.13375	4.70610	4.38865
21					7.11905	5.84285	5.19790	4.76959
22						7.17983	5.90428	5.25908
23							7.23781	5.96293
24								7.29323

M \ N	25	26	27	28	29	30	31	32
1	0.66452	0.65418	0.64441	0.63515	0.62636	0.61801	0.61005	0.60246
2	0.93859	0.92297	0.90825	0.89433	0.88115	0.86865	0.85676	0.84544
3	1.14618	1.12601	1.10704	1.08915	1.07225	1.05623	1.04104	1.02659
4	1.32531	1.30078	1.27776	1.25610	1.23567	1.21636	1.19806	1.18069
5	1.48912	1.46021	1.43314	1.40772	1.38380	1.36122	1.33987	1.31964
6	1.64399	1.61055	1.57931	1.55005	1.52257	1.49668	1.47224	1.44913
7	1.79367	1.75546	1.71986	1.68660	1.65542	1.62611	1.59850	1.57242
8	1.94070	1.89739	1.85716	1.81966	1.78459	1.75171	1.72078	1.69163

M \ N	25	26	27	28	29	30	31	32
9	2.08698	2.03815	1.99294	1.95091	1.91171	1.87503	1.84062	1.80824
10	2.23408	2.17921	2.12858	2.08166	2.03802	1.99729	1.95916	1.92336
11	2.38342	2.32187	2.26529	2.21303	2.16458	2.11948	2.07737	2.03792
12	2.53638	2.46735	2.40417	2.34604	2.29232	2.24248	2.19605	2.15268
13	2.69441	2.61692	2.54633	2.48167	2.42215	2.36709	2.31598	2.26835
14	2.85911	2.77191	2.69293	2.62094	2.55494	2.49414	2.43787	2.38559
15	3.03236	2.93386	2.84525	2.76492	2.69165	2.62443	2.56246	2.50508
16	3.21643	3.10459	3.00475	2.91486	2.83331	2.75887	2.69053	2.62749

M \ N	25	26	27	28	29	30	31	32
17	3.41426	3.28634	3.17322	3.07217	2.98111	2.89845	2.82294	2.75357
18	3.62974	3.48199	3.35287	3.23861	3.13645	3.04433	2.96064	2.88414
19	3.86830	3.69541	3.54655	3.41635	3.30104	3.19787	3.10477	3.02014
20	4.13796	3.93200	3.75809	3.60822	3.47704	3.36077	3.25667	3.16267
21	4.45133	4.19974	3.99287	3.81803	3.66725	3.53517	3.41803	3.31307
22	4.83021	4.51123	4.25885	4.05115	3.87547	3.72386	3.59095	3.47300
23	5.31757	4.88820	4.56859	4.31550	4.10705	3.93061	3.77823	3.64457
24	6.01905	5.37357	4.94379	4.62361	4.36987	4.16075	3.98361	3.83053

M \ N	25	26	27	28	29	30	31	32
25	7.34633	6.07284	5.42730	4.99715	4.67647	4.42216	4.21241	4.03464
26		7.39727	6.12448	5.47891	5.04846	4.72733	4.47250	4.26219
27			7.44622	6.17414	5.52858	5.09786	4.77634	4.52103
28				7.49333	6.22196	5.57644	5.14550	4.82361
29					7.53874	6.26807	5.62261	5.19148
30						7.58255	6.31258	5.66721
31							7.62489	6.35561
32								7.66583

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=3.0

M \ N	33	34	35	36	37	38	39	40
1	0.59520	0.58826	0.58161	0.57523	0.56909	0.56320	0.55752	0.55206
2	0.83464	0.82432	0.81445	0.80499	0.79593	0.78722	0.77885	0.77079
3	1.01283	0.99971	0.98717	0.97518	0.96369	0.95267	0.94209	0.93192
4	1.16418	1.14845	1.13344	1.11910	1.10538	1.09224	1.07964	1.06753
5	1.30043	1.28216	1.26475	1.24814	1.23227	1.21708	1.20253	1.18857
6	1.42721	1.40640	1.38660	1.36773	1.34972	1.33250	1.31603	1.30024
7	1.54774	1.52434	1.50210	1.48095	1.46078	1.44152	1.42311	1.40549
8	1.66409	1.63801	1.61328	1.58977	1.56739	1.54605	1.52567	1.50619

M \ N	33	34	35	36	37	38	39	40
9	1.77770	1.74884	1.72150	1.69556	1.67089	1.64741	1.62501	1.60361
10	1.88967	1.85787	1.82781	1.79933	1.77229	1.74657	1.72207	1.69870
11	2.00086	1.96597	1.93303	1.90187	1.87234	1.84429	1.81761	1.79219
12	2.11203	2.07382	2.03783	2.00384	1.97168	1.94118	1.91221	1.88464
13	2.22382	2.18207	2.14281	2.10581	2.07085	2.03776	2.00637	1.97654
14	2.33686	2.29127	2.24850	2.20827	2.17034	2.13449	2.10054	2.06832
15	2.45174	2.40198	2.35542	2.31171	2.27059	2.23179	2.19512	2.16037
16	2.56909	2.51477	2.46407	2.41660	2.37203	2.33007	2.29048	2.25303

M \ N	33	34	35	36	37	38	39	40
17	2.68955	2.63020	2.57497	2.52340	2.47510	2.42972	2.38699	2.34665
18	2.81383	2.74890	2.68867	2.63261	2.58023	2.53115	2.48503	2.44157
19	2.94273	2.87155	2.80577	2.74474	2.68789	2.63477	2.58496	2.53814
20	3.07717	2.99893	2.92694	2.86038	2.79860	2.74102	2.68719	2.63671
21	3.21824	3.13194	3.05292	2.98018	2.91290	2.85041	2.79216	2.73768
22	3.36726	3.27167	3.18462	3.10488	3.03144	2.96349	2.90034	2.84146
23	3.52587	3.41941	3.32310	3.23537	3.15496	3.08086	3.01228	2.94852
24	3.69617	3.57679	3.46965	3.37269	3.28431	3.20328	3.12858	3.05940

M \ N	33	34	35	36	37	38	39	40
25	3.88091	3.74591	3.62590	3.51813	3.42056	3.33158	3.24996	3.17470
26	4.08383	3.92951	3.79392	3.67332	3.56497	3.46682	3.37729	3.29513
27	4.31020	4.13131	3.97645	3.84031	3.71916	3.61027	3.51159	3.42154
28	4.56788	4.35658	4.17720	4.02183	3.88518	3.76352	3.65413	3.55495
29	4.86928	4.61316	4.40143	4.22159	4.06575	3.92863	3.80649	3.69663
30	5.23592	4.91344	4.65696	4.44484	4.26458	4.10831	3.97074	3.84817
31	5.71034	5.27892	4.95619	4.69939	4.48690	4.30625	4.14958	4.01160
32	6.39724	5.75209	5.32057	4.99760	4.74051	4.52769	4.34668	4.18963

M \ N	33	34	35	36	37	38	39	40
33	7.70548	6.43756	5.79254	5.36094	5.03778	4.78042	4.56729	4.38595
34		7.74390	6.47665	5.83178	5.40011	5.07677	4.81917	4.60576
35			7.78117	6.51459	5.86987	5.43815	5.11465	4.85683
36				7.81736	6.55143	5.90687	5.47512	5.15148
37					7.85252	6.58724	5.94285	5.51108
38						7.88672	6.62207	5.97786
39							7.92000	6.65597
40								7.95241

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=3.5

M \ N	1	2	3	4	5	6	7	8
1	3.50000	2.48141	2.06188	1.81904	1.65572	1.53606	1.44340	1.36882
2		4.51859	3.32047	2.79037	2.47235	2.25401	2.09199	1.96547
3			5.11765	3.85057	3.26740	2.90903	2.65907	2.47156
4				5.54001	4.23935	3.62578	3.24229	2.97160
5					5.86518	4.54613	3.91340	3.51299
6						6.12898	4.79923	4.15364
7							6.35061	5.01442
8								6.54149

M \ N	9	10	11	12	13	14	15	16
1	1.30705	1.25473	1.20966	1.17026	1.13542	1.10430	1.07628	1.05085
2	1.86304	1.77785	1.70550	1.64303	1.58835	1.53994	1.49667	1.45768
3	2.32398	2.20380	2.10340	2.01785	1.94378	1.87880	1.82118	1.76961
4	2.76672	2.60439	2.47152	2.36006	2.26476	2.18203	2.10930	2.04467
5	3.22770	3.01022	2.83693	2.69443	2.57447	2.47159	2.38205	2.30316
6	3.74122	3.44518	3.21817	3.03641	2.88638	2.75965	2.65067	2.55561
7	4.35986	3.93858	3.63436	3.39992	3.21145	3.05535	2.92311	2.80912
8	5.20144	4.54041	4.11242	3.80181	3.56146	3.36756	3.20647	3.06967

M \ N	9	10	11	12	13	14	15	16
9	6.70900	5.36670	4.70090	4.26772	3.95204	3.70688	3.50851	3.34328
10		6.85815	5.51466	4.84529	4.40803	4.08823	3.83913	3.63703
11			6.99249	5.64853	4.97647	4.53594	4.21279	3.96039
12				7.11467	5.77072	5.09662	4.65346	4.32751
13					7.22667	5.88307	5.20741	4.76210
14						7.33002	5.98702	5.31017
15							7.42595	6.08371
16								7.51543

M \ N	17	18	19	20	21	22	23	24
1	1.02763	1.00632	0.98665	0.96843	0.95147	0.93564	0.92081	0.90687
2	1.42230	1.38998	1.36031	1.33293	1.30757	1.28397	1.26194	1.24130
3	1.72308	1.68081	1.64218	1.60669	1.57393	1.54356	1.51530	1.48890
4	1.98674	1.93441	1.88682	1.84329	1.80326	1.76628	1.73198	1.70004
5	2.23294	2.16990	2.11288	2.06096	2.01342	1.96966	1.92921	1.89167
6	2.47168	2.39685	2.32957	2.26863	2.21309	2.16218	2.11528	2.07189
7	2.70947	2.62133	2.54263	2.47176	2.40750	2.34886	2.29505	2.24545
8	2.95149	2.84796	2.75626	2.67424	2.60029	2.53316	2.47183	2.41552

M \ N	17	18	19	20	21	22	23	24
9	3.20263	3.08089	2.97406	2.87928	2.79440	2.71778	2.64814	2.58447
10	3.46829	3.32438	3.19958	3.08990	2.99246	2.90508	2.82611	2.75427
11	3.75514	3.58342	3.43670	3.30926	3.19710	3.09731	3.00773	2.92669
12	4.07234	3.86441	3.69013	3.54097	3.41122	3.29688	3.19503	3.10351
13	4.43383	4.17631	3.96607	3.78957	3.63828	3.50651	3.39024	3.28656
14	4.86311	4.53288	4.27335	4.06111	3.88267	3.72951	3.59595	3.47796
15	5.40597	4.95746	4.62557	4.36430	4.15033	3.97019	3.81538	3.68022
16	6.17408	5.49567	5.04597	4.71266	4.44989	4.23440	4.05275	3.89648

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=3.5

M \ N	17	18	19	20	21	22	23	24
17	7.59927	6.25888	5.57999	5.12929	4.79477	4.53070	4.31387	4.13089
18		7.67812	6.33874	5.65953	5.20801	4.87244	4.60722	4.38922
19			7.75253	6.41421	5.73478	5.28258	4.94611	4.67989
20				7.82296	6.48573	5.80618	5.35341	5.01617
21					7.88983	6.55369	5.87410	5.42086
22						7.95345	6.61841	5.93885
23							8.01413	6.68019
24								8.07213

M \ N	25	26	27	28	29	30	31	32
1	0.89374	0.88135	0.86961	0.85848	0.84791	0.83783	0.82823	0.81905
2	1.22192	1.20367	1.18644	1.17013	1.15467	1.13998	1.12599	1.11266
3	1.46418	1.44095	1.41908	1.39842	1.37887	1.36034	1.34272	1.32596
4	1.67021	1.64225	1.61597	1.59121	1.56783	1.54570	1.52471	1.50476
5	1.85669	1.82399	1.79334	1.76452	1.73735	1.71169	1.68739	1.66434
6	2.03158	1.99401	1.95887	1.92591	1.89491	1.86567	1.83804	1.81187
7	2.19952	2.15683	2.11700	2.07974	2.04476	2.01185	1.98080	1.95144
8	2.36355	2.31540	2.27061	2.22881	2.18966	2.15290	2.11830	2.08564

M \ N	25	26	27	28	29	30	31	32
9	2.52594	2.47189	2.42178	2.37513	2.33156	2.29074	2.25240	2.21628
10	2.68851	2.62803	2.57213	2.52026	2.47195	2.42680	2.38448	2.34470
11	2.85289	2.78529	2.72306	2.66550	2.61205	2.56224	2.51567	2.47199
12	3.02062	2.94507	2.87582	2.81201	2.75296	2.69809	2.64692	2.59905
13	3.19330	3.10876	3.03164	2.96090	2.89567	2.83526	2.77910	2.72670
14	3.37265	3.27783	3.19181	3.11328	3.04118	2.97466	2.91302	2.85568
15	3.56071	3.45393	3.35771	3.27034	3.19053	3.11720	3.04951	2.98674
16	3.75989	3.63901	3.53091	3.43342	3.34484	3.26386	3.18941	3.12064

M \ N	25	26	27	28	29	30	31	32
17	3.97330	3.83544	3.71332	3.60403	3.50539	3.41570	3.33365	3.25818
18	4.20505	4.04629	3.90728	3.78404	3.67367	3.57397	3.48327	3.40024
19	4.46084	4.27561	4.11579	3.97575	3.85149	3.74013	3.63948	3.54785
20	4.74907	4.52908	4.34290	4.18213	4.04114	3.91596	3.80370	3.70217
21	5.08294	4.81506	4.59425	4.40721	4.24558	4.10373	3.97771	3.86462
22	5.48522	5.14672	4.87816	4.65659	4.46878	4.30637	4.16374	4.03695
23	6.00071	5.54677	5.20776	4.93858	4.71635	4.52784	4.36472	4.22138
24	6.73927	6.05992	5.60573	5.26628	4.99656	4.77372	4.58458	4.42081

M \ N	25	26	27	28	29	30	31	32
25	8.12767	6.79589	6.11669	5.66230	5.32247	5.05227	4.82889	4.63917
26		8.18094	6.85022	6.17122	5.71667	5.37651	5.10588	4.88201
27			8.23212	6.90245	6.22366	5.76901	5.42856	5.15754
28				8.28137	6.95273	6.27418	5.81944	5.47875
29					8.32882	7.00120	6.32290	5.86811
30						8.37460	7.04798	6.36995
31							8.41882	7.09318
32								8.46158

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=3.5

M \ N	33	34	35	36	37	38	39	40
1	0.81028	0.80187	0.79380	0.78605	0.77861	0.77144	0.76453	0.75787
2	1.09993	1.08776	1.07610	1.06492	1.05419	1.04387	1.03394	1.02438
3	1.30998	1.29472	1.28013	1.26615	1.25275	1.23989	1.22753	1.21563
4	1.48578	1.46767	1.45038	1.43385	1.41801	1.40283	1.38825	1.37424
5	1.64242	1.62156	1.60167	1.58266	1.56449	1.54708	1.53038	1.51435
6	1.78704	1.76342	1.74094	1.71949	1.69900	1.67939	1.66061	1.64260
7	1.92363	1.89722	1.87211	1.84819	1.82537	1.80355	1.78268	1.76269
8	2.05475	2.02547	1.99767	1.97122	1.94601	1.92195	1.89896	1.87696

M \ N	33	34	35	36	37	38	39	40
9	2.18217	2.14990	2.11931	2.09024	2.06258	2.03622	2.01105	1.98699
10	2.30722	2.27181	2.23829	2.20650	2.17629	2.14754	2.12012	2.09393
11	2.43092	2.39219	2.35560	2.32095	2.28807	2.25681	2.22705	2.19867
12	2.55414	2.51188	2.47203	2.43435	2.39866	2.36478	2.33257	2.30189
13	2.67765	2.63161	2.58827	2.54738	2.50871	2.47206	2.43727	2.40417
14	2.80216	2.75203	2.70495	2.66062	2.61877	2.57919	2.54166	2.50601
15	2.92832	2.87376	2.82265	2.77461	2.72937	2.68664	2.64620	2.60786
16	3.05684	2.99744	2.94192	2.88989	2.84098	2.79488	2.75134	2.71011

M \ N	33	34	35	36	37	38	39	40
17	3.18842	3.12368	3.06336	3.00696	2.95408	2.90436	2.85748	2.81317
18	3.32383	3.25317	3.18755	3.12638	3.06918	3.01551	2.96503	2.91741
19	3.46392	3.38664	3.31514	3.24871	3.18677	3.12880	3.07441	3.02322
20	3.60969	3.52494	3.44685	3.37458	3.30740	3.24473	3.18606	3.13099
21	3.76228	3.66901	3.58350	3.50467	3.43168	3.36380	3.30045	3.24114
22	3.92310	3.82002	3.72603	3.63980	3.56029	3.48663	3.41810	3.35412
23	4.09387	3.97932	3.87556	3.78089	3.69402	3.61386	3.53958	3.47045
24	4.27681	4.14866	4.03346	3.92906	3.83378	3.74629	3.66554	3.59067

M \ N	33	34	35	36	37	38	39	40
25	4.47480	4.33021	4.20146	4.08567	3.98067	3.88481	3.79676	3.71545
26	4.69177	4.52686	4.38171	4.25240	4.13606	4.03052	3.93412	3.84554
27	4.93323	4.74251	4.57710	4.43145	4.30162	4.18477	4.07872	3.98182
28	5.20738	4.98267	4.79152	4.62565	4.47953	4.34923	4.23190	4.12538
29	5.52721	5.25554	5.03046	4.83891	4.67262	4.52606	4.39533	4.27755
30	5.91513	5.57405	5.30210	5.07670	4.88478	4.71811	4.57114	4.44000
31	6.41543	5.96061	5.61937	5.34718	5.12148	4.92923	4.76219	4.61486
32	7.13691	6.45945	6.00464	5.66327	5.39087	5.16489	4.97233	4.80497

M \ N	33	34	35	36	37	38	39	40
33	8.50298	7.17925	6.50209	6.04731	5.70584	5.43324	5.20702	5.01417
34		8.54309	7.22029	6.54343	6.08870	5.74714	5.47437	5.24792
35			8.58200	7.26010	6.58355	6.12889	5.78725	5.51433
36				8.61977	7.29876	6.62252	6.16793	5.82624
37					8.65646	7.33633	6.66041	6.20590
38						8.69214	7.37287	6.69726
39							8.72686	7.40843
40								8.76066

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=4.0

M \ N	1	2	3	4	5	6	7	8
1	4.00000	2.90625	2.44942	2.18264	2.00200	1.86896	1.76549	1.68188
2		5.09375	3.81990	3.24979	2.90517	2.66721	2.48981	2.35073
3			5.73067	4.39002	3.76671	3.38108	3.11073	2.90705
4				6.17756	4.80556	4.15235	3.74156	3.45020
5					6.52056	5.13216	4.46044	4.03291
6						6.79824	5.40085	4.71696
7							7.03114	5.62881
8								7.23147

M \ N	9	10	11	12	13	14	15	16
1	1.61240	1.55338	1.50240	1.45773	1.41813	1.38270	1.35072	1.32166
2	2.23775	2.14350	2.06325	1.99378	1.93284	1.87878	1.83036	1.78666
3	2.74616	2.61473	2.50464	2.41058	2.32896	2.25721	2.19346	2.13629
4	3.22882	3.05282	2.90832	2.78680	2.68266	2.59204	2.51222	2.44117
5	3.72693	3.49282	3.30568	3.15137	3.02113	2.90919	2.81155	2.72537
6	4.27769	3.96105	3.71739	3.52171	3.35975	3.22263	3.10445	3.00116
7	4.93659	4.48878	4.16410	3.91306	3.71066	3.54259	3.39989	3.27662
8	5.82659	5.12851	4.67431	4.34342	4.08654	3.87874	3.70568	3.55838

M \ N	9	10	11	12	13	14	15	16
9	7.40708	6.00111	5.29883	4.83976	4.50397	4.24239	4.03017	3.85297
10		7.56329	6.15718	5.45185	4.98900	4.6492[illegible]	.38387	4.16798
11			7.70391	6.29824	5.59071	5.12489	4.78199	4.51341
12				7.83169	6.42688	5.71775	5.24957	4.90408
13					7.94876	6.54507	5.83480	5.36474
14						8.05674	6.65434	5.94328
15							8.15691	6.75593
16								8.25031

M \ N	17	18	19	20	21	22	23	24
1	1.29508	1.27064	1.24806	1.22710	1.20757	1.18931	1.17219	1.15608
2	1.74693	1.71059	1.67718	1.64630	1.61766	1.59097	1.56603	1.54265
3	2.08463	2.03763	1.99461	1.95504	1.91845	1.88449	1.85285	1.82327
4	2.37737	2.31964	2.26706	2.21890	2.17455	2.13353	2.09543	2.05992
5	2.64853	2.57942	2.51681	2.45972	2.40738	2.35914	2.31449	2.27300
6	2.90980	2.82821	2.75472	2.68807	2.62723	2.57138	2.51988	2.47217
7	3.16865	3.07298	2.98742	2.91025	2.84017	2.77614	2.71731	2.66301
8	3.43087	3.31897	3.21967	3.13072	3.05041	2.97739	2.91060	2.84919

M \ N	17	18	19	20	21	22	23	24
9	3.70183	3.57074	3.45550	3.35309	3.26124	3.17820	3.10262	3.03343
10	3.98733	3.83292	3.69877	3.58067	3.47557	3.38118	3.29576	3.21794
11	4.29444	4.11085	3.95366	3.81687	3.69628	3.58883	3.49223	3.40471
12	4.63284	4.41128	4.22517	4.06558	3.92650	3.80373	3.69422	3.59566
13	5.01709	4.74363	4.51984	4.33157	4.16988	4.02880	3.90412	3.79278
14	5.47171	5.12227	4.84691	4.62122	4.43106	4.26755	4.12471	3.99834
15	6.04433	5.57155	5.22061	4.94364	4.71629	4.52450	4.35938	4.21498
16	6.85081	6.13888	5.66513	5.31294	5.03458	4.80580	4.61256	4.44602

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=4.0

M \ N	17	18	19	20	21	22	23	24
17	8.33777	6.93980	6.22771	5.75318	5.39992	5.12037	4.89034	4.69583
18		8.42001	7.02357	6.31145	5.83630	5.48214	5.20156	4.97043
19			8.49759	7.10270	6.39064	5.91500	5.56009	5.27860
20				8.57100	7.17765	6.46575	5.98972	5.63416
21					8.64067	7.24884	6.53715	6.06083
22						8.70695	7.31662	6.60520
23							8.77015	7.38129
24								8.83053

M \ N	25	26	27	28	29	30	31	32
1	1.14089	1.12653	1.11292	1.10000	1.08771	1.07599	1.06481	1.05412
2	1.52066	1.49992	1.48033	1.46177	1.44416	1.42741	1.41145	1.39622
3	1.79553	1.76944	1.74484	1.72159	1.69957	1.67867	1.65879	1.63986
4	2.02670	1.99554	1.96623	1.93858	1.91245	1.88769	1.86418	1.84183
5	2.23429	2.19808	2.16409	2.13210	2.10192	2.07339	2.04634	2.02066
6	2.42780	2.38640	2.34763	2.31123	2.27696	2.24461	2.21402	2.18501
7	2.61267	2.56583	2.52208	2.48110	2.44261	2.40635	2.37211	2.33971
8	2.79245	2.73982	2.69081	2.64501	2.60209	2.56175	2.52373	2.48782

M \ N	25	26	27	28	29	30	31	32
9	2.96975	2.91088	2.85622	2.80530	2.75768	2.71304	2.67105	2.63147
10	3.14663	3.08095	3.02018	2.96373	2.91110	2.86186	2.81567	2.77221
11	3.32491	3.25172	3.18426	3.12180	3.06374	3.00957	2.95887	2.91128
12	3.50628	3.42471	3.34984	3.28078	3.21680	3.15729	3.10174	3.04973
13	3.69248	3.60144	3.51829	3.44192	3.37142	3.30607	3.24525	3.18844
14	3.88537	3.78351	3.69099	3.60642	3.52868	3.45689	3.39029	3.32827
15	4.08710	3.97268	3.86942	3.77556	3.68971	3.61074	3.53776	3.47002
16	4.30023	4.17100	4.05528	3.95077	3.85570	3.76867	3.68858	3.61452

M \ N	25	26	27	28	29	30	31	32
17	4.52803	4.38100	4.25056	4.13366	4.02801	3.93184	3.84376	3.76264
18	4.77480	4.60587	4.45773	4.32620	4.20824	4.10156	4.00438	3.91533
19	5.04650	4.84988	4.67994	4.53080	4.39829	4.27936	4.17174	4.07365
20	5.35190	5.11894	4.92143	4.75059	4.60054	4.46714	4.34733	4.23885
21	5.70473	5.42178	5.18807	4.98976	4.81811	4.66725	4.53303	4.41242
22	6.12866	5.77210	5.48655	5.25418	5.05515	4.88277	4.73116	4.59620
23	6.67018	6.19348	5.83654	5.55248	5.31750	5.11784	4.94479	4.79251
24	7.44313	6.73236	6.25556	5.89829	5.61377	5.37827	5.17803	5.00438

M \ N	25	26	27	28	29	30	31	32
25	8.88834	7.50236	6.79196	6.31511	5.95756	5.67265	5.43667	5.23591
26		8.94378	7.55919	6.84918	6.37232	6.01454	5.72928	5.49288
27			8.99703	7.61381	6.90420	6.42736	6.06940	5.78384
28				9.04826	7.66638	6.95718	6.48039	6.12228
29					9.09762	7.71703	7.00827	6.53155
30						9.14522	7.76591	7.05758
31							9.19120	7.81313
32								9.23565

EXPECTED VALUES OF GAMMA ORDER STATISTICS

SHAPE PARAMETER ALPHA=4.0

M \ N	33	34	35	36	37	38	39	40
1	1.04389	1.03407	1.02465	1.01560	1.00688	0.99849	0.99040	0.98259
2	1.38167	1.36774	1.35439	1.34158	1.32927	1.31743	1.30603	1.29504
3	1.62179	1.60453	1.58800	1.57217	1.55697	1.54238	1.52834	1.51482
4	1.82053	1.80020	1.78078	1.76219	1.74437	1.72728	1.71085	1.69505
5	1.99624	1.97296	1.95074	1.92951	1.90918	1.88969	1.87100	1.85303
6	2.15746	2.13125	2.10626	2.08241	2.05960	2.03777	2.01684	1.99675
7	2.30898	2.27979	2.25201	2.22552	2.20023	2.17604	2.15288	2.13067
8	2.45383	2.42158	2.39093	2.36175	2.33392	2.30734	2.28192	2.25757

M \ N	33	34	35	36	37	38	39	40
9	2.59406	2.55863	2.52502	2.49306	2.46262	2.43359	2.40585	2.37931
10	2.73122	2.69246	2.65575	2.62090	2.58775	2.55618	2.52605	2.49726
11	2.86649	2.82422	2.78425	2.74636	2.71039	2.67616	2.64355	2.61242
12	3.00087	2.95487	2.91144	2.87035	2.83140	2.79439	2.75918	2.72561
13	3.13522	3.08521	3.03810	2.99361	2.95151	2.91157	2.87362	2.83750
14	3.27032	3.21600	3.16494	3.11682	3.07135	3.02831	2.98747	2.94865
15	3.40692	3.34792	3.29259	3.24056	3.19151	3.14514	3.10123	3.05956
16	3.54575	3.48165	3.42169	3.36543	3.31251	3.26260	3.21540	3.17069

M \ N	33	34	35	36	37	38	39	40
17	3.68760	3.61787	3.55285	3.49200	3.43489	3.38115	3.33043	3.28247
18	3.83328	3.75732	3.68672	3.62085	3.55919	3.50129	3.44678	3.39532
19	3.98371	3.90079	3.82400	3.75259	3.68594	3.62352	3.56489	3.50966
20	4.13992	4.04916	3.96546	3.88790	3.81574	3.74836	3.68523	3.62592
21	4.30315	4.20346	4.11194	4.02750	3.94923	3.87638	3.80833	3.74455
22	4.47486	4.36487	4.26446	4.17226	4.08714	4.00821	3.93471	3.86603
23	4.65687	4.53486	4.42420	4.32314	4.23029	4.14455	4.06500	3.99090
24	4.85148	4.71522	4.59259	4.48132	4.37966	4.28621	4.19988	4.11977

M \ N	33	34	35	36	37	38	39	40
25	5.06172	4.90826	4.77143	4.64823	4.53639	4.43417	4.34017	4.25330
26	5.29166	5.11696	4.96299	4.82564	4.70191	4.58955	4.48680	4.39229
27	5.54706	5.34541	5.17026	5.01581	4.87798	4.75377	4.64092	4.53769
28	5.83646	5.59934	5.39730	5.22174	5.06686	4.92859	4.80393	4.69063
29	6.17333	5.88727	5.64985	5.44747	5.27152	5.11625	4.97756	4.85248
30	6.58096	6.22265	5.93639	5.69870	5.49600	5.31971	5.16407	5.02500
31	7.10525	6.62873	6.27035	5.98393	5.74600	5.54301	5.36641	5.21042
32	7.85880	7.15136	6.67497	6.31655	6.02998	5.79183	5.58859	5.41169

M \ N	33	34	35	36	37	38	39	40
33	9.27868	7.90302	7.19602	6.71977	6.36133	6.07463	5.83629	5.63281
34		9.32037	7.94587	7.23932	6.76322	6.40477	6.11796	5.87946
35			9.36079	7.98743	7.28133	6.80539	6.44695	6.16005
36				9.40003	8.02778	7.32212	6.84636	6.48793
37					9.43815	8.06698	7.36177	6.88618
38						9.47521	8.10510	7.40033
39							9.51126	8.14219
40								9.54637

Table C5

MOMENTS OF EXPONENTIAL, WEIBULL, AND GAMMA POPULATIONS

[Location parameter = 0; scale parameter = 1]

MOMENTS OF EXPONENTIAL, WEIBULL, AND GAMMA POPULATIONS

POPULATION	SHAPE PARAMETER	MEAN	VARIANCE	SKEWNESS	KURTOSIS
EXPONENTIAL		1.00000000	1.00000000	2.00000000	9.00000000
WEIBULL	0.5	2.00000000	20.00000000	6.61876121	87.72000000
WEIBULL	1.0	1.00000000	1.00000000	2.00000000	9.00000000
WEIBULL	1.5	.90274529	.37569028	1.07198657	4.39040356
WEIBULL	2.0	.88622693	.21460184	.63111066	3.24508930
WEIBULL	2.5	.88726382	.14414669	.35863184	2.85678309
WEIBULL	3.0	.89297951	.10533288	.16810284	2.72946363
WEIBULL	3.5	.89974718	.08107275	.02510816	2.71273189
WEIBULL	4.0	.90640248	.06466148	-.08723697	2.74782953
WEIBULL	5.0	.91816874	.04422998	-.25410959	2.88029006
WEIBULL	6.0	.92771933	.03231635	-.37326156	3.03545528
WEIBULL	7.0	.93543756	.02470374	-.46318962	3.18718296
WEIBULL	8.0	.94174270	.01952316	-.53372638	3.32767551
GAMMA	0.5	.50000000	.50000000	2.82842712	15.00000000
GAMMA	1.0	1.00000000	1.00000000	2.00000000	9.00000000
GAMMA	1.5	1.50000000	1.50000000	1.63299316	7.00000000
GAMMA	2.0	2.00000000	2.00000000	1.41421356	6.00000000
GAMMA	2.5	2.50000000	2.50000000	1.26491106	5.40000000
GAMMA	3.0	3.00000000	3.00000000	1.15470054	5.00000000
GAMMA	3.5	3.50000000	3.50000000	1.06904497	4.71428571
GAMMA	4.0	4.00000000	4.00000000	1.00000000	4.50000000

Appendix D

TABLES OF ONE- AND TWO-ORDER-STATISTIC ESTIMATORS FOR EXPONENTIAL POPULATIONS

SOURCES OF TABLES

Tables D1, D3	*Ann. Math. Statist.* 32(1961), 1078–1090 (Harter)
Table D2	*IEEE Trans. Reliability* 14(1965), 100–106; 15(1966), 120–126 (Moore and Harter)
Table D4 A, B	*Rider Anniversary Volume* (1963), 77–100 (Harter) [with additional columns freshly computed (Harter)]
Table D4 C, D	*Technometrics* 6(1964), 301–317 (Harter)

Table D1

MOST EFFICIENT UNBIASED POINT ESTIMATORS FOR σ, BASED ON ONE OR TWO ORDER STATISTICS OF A SAMPLE FROM A ONE-PARAMETER EXPONENTIAL POPULATION

[One-order statistic estimator: $\tilde{\sigma}_k = c_k x_k$; two-order-statistic estimator: $\tilde{\sigma}_{lm} = c_l x_l + c_m x_m$]

Best Estimators of Parameter σ of 1-Parameter Exponential Population

	From 1 Order Statistic, x_k				From 2 Order Statistics, x_ℓ and x_m					
n	k	c_k	V_k/σ^2	$E_k(\%)$	ℓ	m	c_ℓ	c_m	$V_{\ell m}/\sigma^2$	$E_{\ell m}(\%)$
1	1	1.00000	1.000000	100.00						
2	2	.666667	.5555556	90.000	1	2	.500000	.500000	.5000000	100.00
3	3	.545455	.4049587	82.313	2	3	.447368	.342105	.3421053	97.436
4	4	.480000	.3280000	76.220	3	4	.413043	.265217	.2652174	94.262
5	5	.437956	.2807289	71.243	3	5	.527997	.256818	.2140154	93.451
6	5	.689655	.2337165	71.311	4	6	.493892	.216654	.1805452	92.313
7	6	.627803	.2017178	70.820	5	7	.467528	.188618	.1571815	90.887
8	7	.582121	.1787245	69.940	5	8	.553626	.187760	.1393976	89.672
9	8	.546756	.1613595	68.859	6	9	.527062	.167990	.1247200	89.088
10	8	.699806	.1468046	68.118	7	10	.505032	.152501	.1132201	88.324
11	9	.657948	.1333457	68.175	8	11	.486391	.140031	.1039622	87.444
12	10	.623748	.1225454	68.002	8	12	.552632	.140623	.0960924	86.722
13	11	.595191	.1136773	67.668	9	13	.533452	.130469	.0891540	86.281
14	12	.570919	.1062578	67.222	10	14	.516702	.121903	.0833001	85.748
15	12	.673448	.0994728	67.020	11	15	.501916	.114575	.0782930	85.150
16	13	.646247	.0932310	67.038	10	15	.519329	.217012	.0735428	84.984
17	14	.622580	.0878686	66.945	11	16	.506584	.204426	.0692778	84.910
18	15	.601766	.0832093	66.766	12	17	.495052	.193425	.0655497	84.753
19	16	.583292	.0791212	66.520	12	18	.531320	.193368	.0621307	84.711
20	16	.660325	.0752377	66.456	13	19	.519816	.183870	.0590788	84.633
21	17	.640194	.0716497	66.461	14	20	.509272	.175398	.0563567	84.496
22	18	.622092	.0684545	66.401	14	21	.542190	.175587	.0539094	84.317
23	19	.605709	.0655900	66.288	15	22	.531650	.168092	.0516082	84.247
24	20	.590798	.0630065	66.131	16	23	.521895	.161307	.0495251	84.132
25	20	.652475	.0605006	66.115	17	24	.512834	.155136	.0476304	83.980
26	21	.636502	.0581740	66.115	17	25	.542341	.155498	.0458907	83.811
27	22	.621843	.0560556	66.072	18	26	.533236	.149905	.0442401	83.718
28	23	.608333	.0541184	65.993	19	27	.524718	.144765	.0427233	83.594
29	24	.595834	.0523395	65.883	18	27	.529588	.203622	.0412679	83.558
30	24	.647255	.0505915	65.887	19	28	.521922	.196822	.0398898	83.564
31	25	.634017	.0489616	65.884	20	29	.514693	.190530	.0386145	83.539
32	26	.621699	.0474550	65.852	21	30	.507861	.184689	.0374308	83.487
33	27	.610203	.0460582	65.793	21	31	.529266	.184782	.0363033	83.471
34	28	.599445	.0447593	65.711	22	32	.522441	.179406	.0352472	83.444
35	28	.643532	.0434715	65.724	23	33	.515963	.174384	.0342605	83.395
36	29	.632230	.0422665	65.721	23	34	.536163	.174543	.0333365	83.325
37	30	.621609	.0411405	65.694	24	35	.529688	.169881	.0324462	83.298
38	31	.611604	.0400859	65.649	25	36	.523519	.165502	.0316097	83.252
39	31	.651175	.0390941	65.588	26	37	.517635	.161380	.0308224	83.189
40	32	.640744	.0381083	65.603	26	38	.536491	.161608	.0300780	83.117
41	33	.630885	.0371813	65.598	27	39	.530595	.157745	.0293590	83.076
42	34	.621548	.0363080	65.577	27	39	.511693	.194092	.0286687	83.051
43	35	.612692	.0354837	65.539	27	40	.527739	.194098	.0280016	83.052
44	35	.647770	.0346995	65.497	28	41	.522497	.189685	.0273649	83.053
45	36	.638578	.0339230	65.508	29	42	.517464	.185500	.0267612	83.039
46	37	.629834	.0331879	65.503	30	43	.512624	.181525	.0261877	83.013
47	38	.621506	.0324908	65.485	30	44	.527790	.181619	.0256330	83.005
48	39	.613561	.0318289	65.454	31	45	.522953	.177867	.0251035	82.990
49	39	.645063	.0311934	65.425	32	46	.518293	.174292	.0245990	82.963
50	40	.636847	.0305660	65.432	32	47	.532844	.174417	.0241175	82.927

Best Estimators of Parameter σ of 1-Parameter Exponential Population

	From 1 Order Statistic, x_k				From 2 Order Statistics, x_ℓ and x_m					
n	k	c_k	V_k/σ^2	$E_k(\%)$	ℓ	m	c_ℓ	c_m	$V_{\ell m}/\sigma^2$	$E_{\ell m}(\%)$
51	41	.628992	.0299688	65.427	33	48	.528185	.171029	.0236490	82.912
52	42	.621475	.0293996	65.412	34	49	.523688	.167791	.0232014	82.886
53	43	.614272	.0288564	65.386	35	50	.519344	.164695	.0227732	82.851
54	43	.642858	.0283310	65.365	35	51	.533183	.164857	.0223621	82.812
55	44	.635431	.0278136	65.370	35	51	.518358	.192720	.0219586	82.800
56	45	.628302	.0273189	65.366	36	52	.514374	.189295	.0215684	82.793
57	46	.621452	.0268453	65.352	36	53	.526631	.189331	.0211897	82.794
58	47	.614863	.0263915	65.329	37	54	.522652	.186069	.0208246	82.793
59	47	.641028	.0259499	65.315	38	55	.518794	.182935	.0204738	82.784
60	48	.634252	.0255159	65.319	39	56	.515050	.179922	.0201366	82.768
61	49	.627725	.0250994	65.314	39	57	.526789	.180005	.0198076	82.763
62	50	.621434	.0246992	65.302	40	58	.523047	.177123	.0194905	82.753
63	51	.615363	.0243145	65.282	41	59	.519411	.174347	.0191850	82.737
64	51	.639486	.0239381	65.273	41	60	.530779	.174447	.0188902	82.715
65	52	.633255	.0235689	65.275	42	61	.527144	.171785	.0186019	82.704
66	53	.627237	.0232133	65.271	43	62	.523609	.169216	.0183238	82.688
67	54	.621420	.0228707	65.260	44	63	.520168	.166736	.0180552	82.665
68	55	.615792	.0225404	65.242	43	63	.522477	.191905	.0177944	82.643
69	55	.638167	.0222158	65.236	44	64	.519185	.189124	.0175365	82.644
70	56	.632401	.0218979	65.238	45	65	.515976	.186434	.0172871	82.638
71	57	.626818	.0215909	65.234	45	66	.525891	.186478	.0170434	82.639
72	58	.621409	.0212943	65.224	46	67	.522686	.183891	.0168070	82.638
73	59	.616163	.0210076	65.208	47	68	.519559	.181386	.0165781	82.631
74	59	.637027	.0207248	65.204	48	69	.516508	.178961	.0163564	82.619
75	60	.631661	.0204481	65.206	48	70	.526081	.179033	.0161388	82.617
76	61	.626455	.0201804	65.201	49	71	.523031	.176693	.0159279	82.609
77	62	.621399	.0199211	65.192	50	72	.520052	.174423	.0157233	82.597
78	63	.616488	.0196699	65.178	50	73	.529377	.174507	.0155244	82.583
79	63	.636031	.0194214	65.177	51	74	.526398	.172314	.0153294	82.575
80	64	.631014	.0191784	65.177	52	75	.523487	.170185	.0151399	82.563
81	65	.626136	.0189428	65.173	53	76	.520640	.168116	.0149559	82.547
82	66	.621392	.0187142	65.165	52	76	.522467	.189026	.0147749	82.540
83	67	.616774	.0184924	65.152	53	77	.519723	.186749	.0145969	82.539
84	67	.635154	.0182722	65.152	54	78	.517038	.184536	.0144240	82.535
85	68	.630443	.0180572	65.153	54	79	.525362	.184580	.0142541	82.536
86	69	.625856	.0178483	65.149	55	80	.522678	.182437	.0140886	82.534
87	70	.621385	.0176452	65.141	56	81	.520050	.180352	.0139276	82.529
88	71	.617028	.0174478	65.129	56	82	.528185	.180407	.0137707	82.520
89	71	.634376	.0172514	65.131	57	83	.525558	.178385	.0136163	82.518
90	72	.629936	.0170598	65.130	58	84	.522984	.176415	.0134660	82.512
91	73	.625605	.0168733	65.127	59	85	.520461	.174496	.0133195	82.503
92	74	.621380	.0166917	65.119	59	86	.528366	.174567	.0131763	82.493
93	75	.617256	.0165150	65.109	60	87	.525843	.172703	.0130356	82.487
94	75	.633681	.0163387	65.111	61	88	.523368	.170884	.0128984	82.478
95	76	.629482	.0161668	65.111	62	89	.520941	.169111	.0127645	82.466
96	77	.625382	.0159993	65.107	61	89	.522452	.186991	.0126315	82.466
97	78	.621376	.0158360	65.100	62	90	.520100	.185065	.0125015	82.465
98	78	.637131	.0156767	65.091	63	91	.517792	.183185	.0123745	82.461
99	79	.633057	.0155177	65.093	63	92	.524964	.183228	.0122493	82.462
100	80	.629074	.0153627	65.093	64	93	.522657	.181399	.0121271	82.460

Table D2

UNBIASED POINT ESTIMATORS FOR σ, BASED ON ONE ORDER STATISTIC OF A CENSORED SAMPLE FROM A ONE-PARAMETER EXPONENTIAL POPULATION

[Estimator: $\tilde{\sigma}_k = c_k c_k$, where $c_k = C(K, N)$ and the Kth order statistic is optimal when the first M order statistics of a sample of size N are known (single censoring from above)]

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
1	1	1	1.00000	100.00	10	6	6	1.18254	94.47
2	1	1	2.00000	100.00	10	7	7	0.91271	90.90
2	2	2	0.66667	90.00	10	8	8	0.69981	85.15
3	1	1	3.00000	100.00	10	8	9	0.69981	75.69
3	2	2	1.20000	96.15	10	8	10	0.69981	68.12
3	3	3	0.54545	82.31	11	1	1	11.00000	100.00
4	1	1	4.00000	100.00	11	2	2	5.23810	99.77
4	2	2	1.71429	98.00	11	3	3	3.31104	99.33
4	3	3	0.92308	92.35	11	4	4	2.34181	98.60
4	4	4	0.48000	76.22	11	5	5	1.75476	97.46
5	1	1	5.00000	100.00	11	6	6	1.35769	95.76
5	2	2	2.22222	98.78	11	7	7	1.06776	93.22
5	3	3	1.27660	95.75	11	8	8	0.84278	89.37
5	4	4	0.77922	88.81	11	9	9	0.65795	83.33
5	5	5	0.43796	71.24	11	9	10	0.65795	74.99
6	1	1	6.00000	100.00	11	9	11	0.65795	68.18
6	2	2	2.72727	99.18	12	1	1	12.00000	100.00
6	3	3	1.62162	97.30	12	2	2	5.73913	99.81
6	4	4	1.05263	93.47	12	3	3	3.64641	99.45
6	5	5	0.68966	85.57	12	4	4	2.59502	98.85
6	5	6	0.68966	71.31	12	5	5	1.95943	97.96
7	1	1	7.00000	100.00	12	6	6	1.53090	96.64
7	2	2	3.23077	99.41	12	7	7	1.21969	94.73
7	3	3	1.96262	98.13	12	8	8	0.98051	91.97
7	4	4	1.31661	95.71	12	9	9	0.78748	87.89
7	5	5	0.91503	91.24	12	10	10	0.62375	81.60
7	6	6	0.62780	82.62	12	10	11	0.62375	74.18
7	6	7	0.62780	70.82	12	10	12	0.62375	68.00
8	1	1	8.00000	100.00	13	1	1	13.00000	100.00
8	2	2	3.73333	99.56	13	2	2	6.24000	99.84
8	3	3	2.30137	98.63	13	3	3	3.98144	99.54
8	4	4	1.57598	96.96	13	4	4	2.84766	99.05
8	5	5	1.13055	94.09	13	5	5	2.16321	98.32
8	6	6	0.82111	89.10	13	6	6	1.70278	97.27
8	7	7	0.58212	79.93	13	7	7	1.36961	95.79
8	7	8	0.58212	69.94	13	8	8	1.11508	93.71
9	1	1	9.00000	100.00	13	9	9	0.91174	90.75
9	2	2	4.23529	99.66	13	10	10	0.74250	86.46
9	3	3	2.63874	98.95	13	11	11	0.59519	79.97
9	4	4	1.83273	97.73	13	11	12	0.59519	73.31
9	5	5	1.34114	95.73	13	11	13	0.59519	67.67
9	6	6	1.00438	92.48	14	1	1	14.00000	100.00
9	7	7	0.75246	87.07	14	2	2	6.74074	99.86
9	8	8	0.54676	77.47	14	3	3	4.31621	99.60
9	8	9	0.54676	68.86	14	4	4	3.09987	99.19
10	1	1	10.00000	100.00	14	5	5	2.36634	98.59
10	2	2	4.73684	99.72	14	6	6	1.87369	97.73
10	3	3	2.97521	99.17	14	7	7	1.51813	96.55
10	4	4	2.08782	98.24	14	8	8	1.24756	94.92
10	5	5	1.54886	96.76	14	9	9	1.03281	92.68

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
14	10	10	0.85600	89.56	17	14	15	0.62258	75.87
14	11	11	0.70510	85.09	17	14	16	0.62258	71.13
14	12	12	0.57092	78.43	17	14	17	0.62258	66.94
14	12	13	0.57092	72.39	18	1	1	18.00000	100.00
14	12	14	0.57092	67.22	18	2	2	8.74286	99.92
15	1	1	15.00000	100.00	18	3	3	5.65358	99.77
15	2	2	7.24138	99.88	18	4	4	4.10600	99.54
15	3	3	4.65077	99.66	18	5	5	3.17486	99.21
15	4	4	3.35175	99.31	18	6	6	2.55169	98.77
15	5	5	2.56897	98.80	18	7	7	2.10424	98.18
15	6	6	2.04390	98.09	18	8	8	1.76635	97.42
15	7	7	1.66563	97.12	18	9	9	1.50119	96.44
15	8	8	1.37860	95.82	18	10	10	1.28659	95.18
15	9	9	1.15177	94.06	18	11	11	1.10834	93.56
15	10	10	0.96628	91.67	18	12	12	0.95684	91.47
15	11	11	0.80979	88.40	18	13	13	0.82524	88.74
15	12	12	0.67345	83.77	18	14	14	0.70833	85.10
15	12	13	0.67345	77.33	18	15	15	0.60177	80.12
15	12	14	0.67345	71.81	18	15	16	0.60177	75.11
15	12	15	0.67345	67.02	18	15	17	0.60177	70.69
16	1	1	16.00000	100.00	18	15	18	0.60177	66.77
16	2	2	7.74194	99.90	19	1	1	19.00000	100.00
16	3	3	4.98516	99.70	19	2	2	9.24324	99.93
16	4	4	3.60337	99.40	19	3	3	5.98764	99.79
16	5	5	2.77122	98.97	19	4	4	4.35710	99.59
16	6	6	2.21356	98.37	19	5	5	3.37636	99.30
16	7	7	1.81238	97.56	19	6	6	2.72030	98.91
16	8	8	1.50859	96.49	19	7	7	2.24957	98.41
16	9	9	1.26924	95.07	19	8	8	1.89443	97.75
16	10	10	1.07443	93.19	19	9	9	1.61611	96.92
16	11	11	0.91125	90.68	19	10	10	1.39126	95.86
16	12	12	0.77077	87.27	19	11	11	1.20499	94.52
16	13	13	0.64625	82.51	19	12	12	1.04725	92.81
16	13	14	0.64625	76.61	19	13	13	0.91096	90.63
16	13	15	0.64625	71.51	19	14	14	0.79089	87.81
16	13	16	0.64625	67.04	19	15	15	0.68287	84.07
17	1	1	17.00000	100.00	19	16	16	0.58329	78.99
17	2	2	8.24242	99.91	19	16	17	0.58329	74.35
17	3	3	5.31943	99.74	19	16	18	0.58329	70.22
17	4	4	3.85477	99.48	19	16	19	0.58329	66.52
17	5	5	2.97317	99.10	20	1	1	20.00000	100.00
17	6	6	2.38280	98.59	20	2	2	9.74359	99.93
17	7	7	1.95854	97.91	20	3	3	6.32163	99.82
17	8	8	1.63778	97.01	20	4	4	4.60807	99.63
17	9	9	1.38563	95.84	20	5	5	3.57768	99.38
17	10	10	1.18106	94.32	20	6	6	2.88869	99.04
17	11	11	1.01056	92.33	20	7	7	2.39460	98.59
17	12	12	0.86489	89.70	20	8	8	2.02213	98.02
17	13	13	0.73734	86.17	20	9	9	1.73052	97.30
17	14	14	0.62258	81.29	20	10	10	1.49528	96.40

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
20	11	11	1.30078	95.27	22	18	20	0.62209	73.04
20	12	12	1.13652	93.85	22	18	21	0.62209	69.56
20	13	13	0.99514	92.07	22	18	22	0.62209	66.40
20	14	14	0.87128	89.81	23	1	1	23.00000	100.00
20	15	15	0.76080	86.89	23	2	2	11.24444	99.95
20	16	16	0.66032	83.07	23	3	3	7.32323	99.86
20	16	17	0.66032	78.18	23	4	4	5.36044	99.73
20	16	18	0.66032	73.84	23	5	5	4.18089	99.54
20	16	19	0.66032	69.95	23	6	6	3.39283	99.30
20	16	20	0.66032	66.46	23	7	7	2.82835	98.99
21	1	1	21.00000	100.00	23	8	8	2.40349	98.59
21	2	2	10.24390	99.94	23	9	9	2.07155	98.11
21	3	3	6.65555	99.83	23	10	10	1.80454	97.51
21	4	4	4.85894	99.67	23	11	11	1.58458	96.78
21	5	5	3.77887	99.44	23	12	12	1.39975	95.89
21	6	6	3.05689	99.14	23	13	13	1.24174	94.81
21	7	7	2.53938	98.75	23	14	14	1.10458	93.49
21	8	8	2.14950	98.25	23	15	15	0.98383	91.88
21	9	9	1.84451	97.62	23	16	16	0.87609	89.89
21	10	10	1.59877	96.84	23	17	17	0.77864	87.41
21	11	11	1.39589	95.88	23	18	18	0.68920	84.28
21	12	12	1.22490	94.68	23	19	19	0.60571	80.24
21	13	13	1.07817	93.19	23	19	20	0.60571	76.23
21	14	14	0.95012	91.33	23	19	21	0.60571	72.60
21	15	15	0.83657	88.99	23	19	22	0.60571	69.30
21	16	16	0.73420	86.00	23	19	23	0.60571	66.29
21	17	17	0.64019	82.10	24	1	1	24.00000	100.00
21	17	18	0.64019	77.54	24	2	2	11.74468	99.95
21	17	19	0.64019	73.46	24	3	3	7.65700	99.87
21	17	20	0.64019	69.78	24	4	4	5.61109	99.75
21	17	21	0.64019	66.46	24	5	5	4.38177	99.58
22	1	1	22.00000	100.00	24	6	6	3.56062	99.36
22	2	2	10.74419	99.95	24	7	7	2.97260	99.08
22	3	3	6.98941	99.85	24	8	8	2.53018	98.73
22	4	4	5.10973	99.70	24	9	9	2.18470	98.30
22	5	5	3.97993	99.50	24	10	10	1.90696	97.77
22	6	6	3.22493	99.23	24	11	11	1.67835	97.12
22	7	7	2.68396	98.88	24	12	12	1.48644	96.34
22	8	8	2.27660	98.44	24	13	13	1.32261	95.41
22	9	9	1.95818	97.89	24	14	14	1.18065	94.27
22	10	10	1.70183	97.21	24	15	15	1.05598	92.90
22	11	11	1.49046	96.37	24	16	16	0.94509	91.23
22	12	12	1.31260	95.34	24	17	17	0.84524	89.18
22	13	13	1.16030	94.08	24	18	18	0.75417	86.64
22	14	14	1.02780	92.53	24	19	19	0.66996	83.45
22	15	15	0.91078	90.61	24	20	20	0.59080	79.36
22	16	16	0.80592	88.19	24	20	21	0.59080	75.58
22	17	17	0.71049	85.13	24	20	22	0.59080	72.14
22	18	18	0.62209	81.16	24	20	23	0.59080	69.01
22	18	19	0.62209	76.89	24	20	24	0.59080	66.13

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
25	1	1	25.00000	100.00	26	21	26	0.63650	66.11
25	2	2	12.24490	99.96	27	1	1	27.00000	100.00
25	3	3	7.99074	99.88	27	2	2	13.24528	99.96
25	4	4	5.86168	99.77	27	3	3	8.65812	99.90
25	5	5	4.58256	99.62	27	4	4	6.36273	99.81
25	6	6	3.72830	99.42	27	5	5	4.98396	99.68
25	7	7	3.11672	99.16	27	6	6	4.06342	99.51
25	8	8	2.65671	98.85	27	7	7	3.40464	99.30
25	9	9	2.29764	98.46	27	8	8	2.90937	99.04
25	10	10	2.00912	97.98	27	9	9	2.52303	98.72
25	11	11	1.77181	97.41	27	10	10	2.21286	98.33
25	12	12	1.57276	96.73	27	11	11	1.95799	97.87
25	13	13	1.40302	95.90	27	12	12	1.74451	97.33
25	14	14	1.25615	94.92	27	13	13	1.56276	96.68
25	15	15	1.12741	93.74	27	14	14	1.40583	95.92
25	16	16	1.01318	92.31	27	15	15	1.26864	95.01
25	17	17	0.91066	90.59	27	16	16	1.14734	93.94
25	18	18	0.81759	88.48	27	17	17	1.03897	92.66
25	19	19	0.73209	85.89	27	18	18	0.94119	91.15
25	20	20	0.65248	82.64	27	19	19	0.85208	89.33
25	20	21	0.65248	78.71	27	20	20	0.77006	87.13
25	20	22	0.65248	75.13	27	21	21	0.69374	84.43
25	20	23	0.65248	71.86	27	22	22	0.62184	81.09
25	20	24	0.65248	68.87	27	22	23	0.62184	77.56
25	20	25	0.65248	66.12	27	22	24	0.62184	74.33
26	1	1	26.00000	100.00	27	22	25	0.62184	71.36
26	2	2	12.74510	99.96	27	22	26	0.62184	68.61
26	3	3	8.32444	99.89	27	22	27	0.62184	66.07
26	4	4	6.11223	99.79	28	1	1	28.00000	100.00
26	5	5	4.78329	99.65	28	2	2	13.74545	99.97
26	6	6	3.89590	99.47	28	3	3	8.99177	99.91
26	7	7	3.26073	99.24	28	4	4	6.61319	99.82
26	8	8	2.78310	98.95	28	5	5	5.18458	99.70
26	9	9	2.41041	98.60	28	6	6	4.23087	99.55
26	10	10	2.11108	98.17	28	7	7	3.54846	99.35
26	11	11	1.86501	97.66	28	8	8	3.03553	99.12
26	12	12	1.65877	97.05	28	9	9	2.63552	98.82
26	13	13	1.48305	96.32	28	10	10	2.31448	98.48
26	14	14	1.33119	95.46	28	11	11	2.05078	98.06
26	15	15	1.19826	94.43	28	12	12	1.83002	97.57
26	16	16	1.08055	93.20	28	13	13	1.64219	96.99
26	17	17	0.97518	91.73	28	14	14	1.48015	96.31
26	18	18	0.87985	89.95	28	15	15	1.33862	95.50
26	19	19	0.79267	87.80	28	16	16	1.21365	94.56
26	20	20	0.71204	85.15	28	17	17	1.10218	93.45
26	21	21	0.63650	81.86	28	18	18	1.00180	92.13
26	21	22	0.63650	78.14	28	19	19	0.91058	90.57
26	21	23	0.63650	74.74	28	20	20	0.82692	88.71
26	21	24	0.63650	71.62	28	21	21	0.74945	86.46
26	21	25	0.63650	68.76	28	22	22	0.67697	83.73

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
28	23	23	0.60833	80.34	30	16	16	1.34513	95.54
28	23	24	0.60833	76.99	30	17	17	1.22721	94.67
28	23	25	0.60833	73.91	30	18	18	1.12136	93.66
28	23	26	0.60833	71.07	30	19	19	1.02553	92.47
28	23	27	0.60833	68.44	30	20	20	0.93807	91.08
28	23	28	0.60833	65.99	30	21	21	0.85762	89.45
29	1	1	29.00000	100.00	30	22	22	0.78301	87.50
29	2	2	14.24561	99.97	30	23	23	0.71320	85.18
29	3	3	9.32539	99.91	30	24	24	0.64725	82.36
29	4	4	6.86362	99.83	30	24	25	0.64725	79.06
29	5	5	5.38516	99.72	30	24	26	0.64725	76.02
29	6	6	4.39827	99.58	30	24	27	0.64725	73.21
29	7	7	3.69221	99.40	30	24	28	0.64725	70.59
29	8	8	3.16160	99.18	30	24	29	0.64725	68.16
29	9	9	2.74790	98.92	30	24	30	0.64725	65.89
29	10	10	2.41596	98.60	31	1	1	31.00000	100.00
29	11	11	2.14341	98.22	31	2	2	15.24590	99.97
29	12	12	1.91534	97.78	31	3	3	9.99259	99.93
29	13	13	1.72139	97.25	31	4	4	7.36440	99.86
29	14	14	1.55418	96.64	31	5	5	5.78618	99.76
29	15	15	1.40827	95.93	31	6	6	4.73290	99.64
29	16	16	1.27956	95.09	31	7	7	3.97951	99.49
29	17	17	1.16490	94.11	31	8	8	3.41351	99.30
29	18	18	1.06182	92.96	31	9	9	2.97237	99.07
29	19	19	0.96835	91.61	31	10	10	2.61858	98.81
29	20	20	0.88286	90.01	31	11	11	2.32826	98.49
29	21	21	0.80399	88.10	31	12	12	2.08548	98.12
29	22	22	0.73057	85.81	31	13	13	1.87921	97.69
29	23	23	0.66153	83.04	31	14	14	1.70157	97.19
29	24	24	0.59583	79.61	31	15	15	1.54675	96.61
29	24	25	0.59583	76.42	31	16	16	1.41041	95.93
29	24	26	0.59583	73.48	31	17	17	1.28919	95.16
29	24	27	0.59583	70.76	31	18	18	1.18048	94.25
29	24	28	0.59583	68.24	31	19	19	1.08221	93.21
29	24	29	0.59583	65.88	31	20	20	0.99269	91.99
30	1	1	30.00000	100.00	31	21	21	0.91052	90.56
30	2	2	14.74576	99.97	31	22	22	0.83453	88.89
30	3	3	9.65900	99.92	31	23	23	0.76372	86.91
30	4	4	7.11402	99.85	31	24	24	0.69716	84.55
30	5	5	5.58569	99.74	31	25	25	0.63402	81.70
30	6	6	4.56561	99.61	31	25	26	0.63402	78.55
30	7	7	3.83589	99.45	31	25	27	0.63402	75.65
30	8	8	3.28759	99.25	31	25	28	0.63402	72.94
30	9	9	2.86018	99.00	31	25	29	0.63402	70.43
30	10	10	2.51732	98.71	31	25	30	0.63402	68.08
30	11	11	2.23590	98.36	31	25	31	0.63402	65.88
30	12	12	2.00048	97.96	32	1	1	32.00000	100.00
30	13	13	1.80039	97.49	32	2	2	15.74603	99.97
30	14	14	1.62798	96.93	32	3	3	10.32616	99.93
30	15	15	1.47763	96.29	32	4	4	7.61475	99.87

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
32	5	5	5.98665	99.78	33	23	23	0.86220	89.54
32	6	6	4.90015	99.66	33	24	24	0.79376	87.80
32	7	7	4.12308	99.52	33	25	25	0.72943	85.76
32	8	8	3.53936	99.35	33	26	26	0.66848	83.33
32	9	9	3.08448	99.14	33	27	27	0.61020	80.41
32	10	10	2.71974	98.89	33	27	28	0.61020	77.54
32	11	11	2.42051	98.60	33	27	29	0.61020	74.87
32	12	12	2.17035	98.26	33	27	30	0.61020	72.37
32	13	13	1.95788	97.87	33	27	31	0.61020	70.04
32	14	14	1.77498	97.41	33	27	32	0.61020	67.85
32	15	15	1.61566	96.88	33	27	33	0.61020	65.79
32	16	16	1.47544	96.28	34	1	1	34.00000	100.00
32	17	17	1.35087	95.58	34	2	2	16.74627	99.98
32	18	18	1.23926	94.77	34	3	3	10.99326	99.94
32	19	19	1.13848	93.84	34	4	4	8.11538	99.88
32	20	20	1.04681	92.76	34	5	5	6.38748	99.80
32	21	21	0.96282	91.51	34	6	6	5.23453	99.71
32	22	22	0.88533	90.05	34	7	7	4.41008	99.58
32	23	23	0.81332	88.34	34	8	8	3.79089	99.43
32	24	24	0.74591	86.33	34	9	9	3.30850	99.25
32	25	25	0.68230	83.93	34	10	10	2.92183	99.04
32	26	26	0.62170	81.05	34	11	11	2.60472	98.79
32	26	27	0.62170	78.05	34	12	12	2.33975	98.50
32	26	28	0.62170	75.26	34	13	13	2.11483	98.17
32	26	29	0.62170	72.66	34	14	14	1.92134	97.79
32	26	30	0.62170	70.24	34	15	15	1.75294	97.35
32	26	31	0.62170	67.98	34	16	16	1.60487	96.84
32	26	32	0.62170	65.85	34	17	17	1.47350	96.27
33	1	1	33.00000	100.00	34	18	18	1.35597	95.61
33	2	2	16.24615	99.98	34	19	19	1.25003	94.85
33	3	3	10.65972	99.93	34	20	20	1.15387	93.99
33	4	4	7.86507	99.87	34	21	21	1.06601	93.00
33	5	5	6.18708	99.79	34	22	22	0.98522	91.87
33	6	6	5.06736	99.69	34	23	23	0.91047	90.56
33	7	7	4.26660	99.55	34	24	24	0.84087	89.04
33	8	8	3.66515	99.39	34	25	25	0.77565	87.27
33	9	9	3.19652	99.20	34	26	26	0.71411	85.20
33	10	10	2.82082	98.97	34	27	27	0.65559	82.74
33	11	11	2.51266	98.70	34	28	28	0.59944	79.79
33	12	12	2.25510	98.39	34	28	29	0.59944	77.04
33	13	13	2.03642	98.03	34	28	30	0.59944	74.47
33	14	14	1.84823	97.61	34	28	31	0.59944	72.07
33	15	15	1.68438	97.13	34	28	32	0.59944	69.82
33	16	16	1.54025	96.58	34	28	33	0.59944	67.70
33	17	17	1.41229	95.94	34	28	34	0.59944	65.71
33	18	18	1.29774	95.22	35	1	1	35.00000	100.00
33	19	19	1.19441	94.38	35	2	2	17.24638	99.98
33	20	20	1.10052	93.42	35	3	3	11.32680	99.94
33	21	21	1.01462	92.31	35	4	4	8.36566	99.89
33	22	22	0.93552	91.03	35	5	5	6.58786	99.82

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
35	6	6	5.40168	99.72	36	21	21	1.16777	94.13
35	7	7	4.55352	99.61	36	22	22	1.08343	93.21
35	8	8	3.91658	99.47	36	23	23	1.00561	92.18
35	9	9	3.42042	99.30	36	24	24	0.93340	90.99
35	10	10	3.02276	99.10	36	25	25	0.86604	89.62
35	11	11	2.69670	98.87	36	26	26	0.80283	88.05
35	12	12	2.42430	98.60	36	27	27	0.74317	86.23
35	13	13	2.19314	98.30	36	28	28	0.68648	84.10
35	14	14	1.99433	97.94	36	29	29	0.63223	81.58
35	15	15	1.82136	97.54	36	29	30	0.63223	78.86
35	16	16	1.66933	97.08	36	29	31	0.63223	76.32
35	17	17	1.53451	96.55	36	29	32	0.63223	73.94
35	18	18	1.41397	95.95	36	29	33	0.63223	71.70
35	19	19	1.30539	95.27	36	29	34	0.63223	69.59
35	20	20	1.20692	94.49	36	29	35	0.63223	67.60
35	21	21	1.11705	93.60	36	29	36	0.63223	65.72
35	22	22	1.03450	92.59	37	1	1	37.00000	100.00
35	23	23	0.95825	91.43	37	2	2	18.24658	99.98
35	24	24	0.88739	90.09	37	3	3	11.99383	99.95
35	25	25	0.82114	88.54	37	4	4	8.86619	99.90
35	26	26	0.75883	86.75	37	5	5	6.98856	99.84
35	27	27	0.69983	84.64	37	6	6	5.73588	99.75
35	28	28	0.64353	82.16	37	7	7	4.84029	99.65
35	28	29	0.64353	79.32	37	8	8	4.16784	99.53
35	28	30	0.64353	76.68	37	9	9	3.64411	99.38
35	28	31	0.64353	74.21	37	10	10	3.22446	99.21
35	28	32	0.64353	71.89	37	11	11	2.88046	99.01
35	28	33	0.64353	69.71	37	12	12	2.59317	98.78
35	28	34	0.64353	67.66	37	13	13	2.34947	98.51
35	28	35	0.64353	65.72	37	14	14	2.13998	98.21
36	1	1	36.00000	100.00	37	15	15	1.95782	97.86
36	2	2	17.74648	99.98	37	16	16	1.79783	97.47
36	3	3	11.66032	99.95	37	17	17	1.65605	97.03
36	4	4	8.61594	99.89	37	18	18	1.52941	96.53
36	5	5	6.78822	99.83	37	19	19	1.41547	95.96
36	6	6	5.56879	99.74	37	20	20	1.31228	95.31
36	7	7	4.69692	99.63	37	21	21	1.21824	94.59
36	8	8	4.04223	99.50	37	22	22	1.13204	93.76
36	9	9	3.53229	99.34	37	23	23	1.05261	92.83
36	10	10	3.12364	99.16	37	24	24	0.97900	91.76
36	11	11	2.78861	98.94	37	25	25	0.91044	90.55
36	12	12	2.50877	98.70	37	26	26	0.84623	89.16
36	13	13	2.27135	98.41	37	27	27	0.78578	87.57
36	14	14	2.06720	98.08	37	28	28	0.72853	85.72
36	15	15	1.88964	97.71	37	29	29	0.67398	83.56
36	16	16	1.73364	97.29	37	30	30	0.62161	81.02
36	17	17	1.59536	96.80	37	30	31	0.62161	78.41
36	18	18	1.47178	96.25	37	30	32	0.62161	75.96
36	19	19	1.36053	95.63	37	30	33	0.62161	73.66
36	20	20	1.25972	94.93	37	30	34	0.62161	71.49

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
37	30	35	0.62161	69.45	39	10	10	3.42596	99.30
37	30	36	0.62161	67.52	39	11	11	3.06399	99.12
37	30	37	0.62161	65.69	39	12	12	2.76177	98.92
38	1	1	38.00000	100.00	39	13	13	2.50549	98.69
38	2	2	18.74667	99.98	39	14	14	2.28527	98.43
38	3	3	12.32733	99.95	39	15	15	2.09387	98.13
38	4	4	9.11643	99.91	39	16	16	1.92585	97.79
38	5	5	7.18888	99.85	39	17	17	1.77705	97.41
38	6	6	5.90295	99.77	39	18	18	1.64424	96.99
38	7	7	4.98363	99.67	39	19	19	1.52485	96.50
38	8	8	4.29341	99.56	39	20	20	1.41683	95.96
38	9	9	3.75589	99.42	39	21	21	1.31850	95.36
38	10	10	3.32523	99.26	39	22	22	1.22852	94.67
38	11	11	2.97225	99.07	39	23	23	1.14572	93.90
38	12	12	2.67750	98.85	39	24	24	1.06916	93.04
38	13	13	2.42752	98.61	39	25	25	0.99802	92.06
38	14	14	2.21266	98.32	39	26	26	0.93161	90.95
38	15	15	2.02589	98.00	39	27	27	0.86931	89.69
38	16	16	1.86189	97.64	39	28	28	0.81059	88.26
38	17	17	1.71661	97.23	39	29	29	0.75496	86.61
38	18	18	1.58689	96.77	39	30	30	0.70196	84.72
38	19	19	1.47024	96.25	39	31	31	0.65117	82.51
38	20	20	1.36464	95.66	39	31	32	0.65117	79.94
38	21	21	1.26847	94.99	39	31	33	0.65117	77.51
38	22	22	1.18040	94.24	39	31	34	0.65117	75.23
38	23	23	1.09930	93.40	39	31	35	0.65117	73.08
38	24	24	1.02423	92.44	39	31	36	0.65117	71.05
38	25	25	0.95441	91.36	39	31	37	0.65117	69.13
38	26	26	0.88913	90.12	39	31	38	0.65117	67.31
38	27	27	0.82780	88.71	39	31	39	0.65117	65.59
38	28	28	0.76986	87.09	40	1	1	40.00000	100.00
38	29	29	0.71483	85.21	40	2	2	19.74684	99.98
38	30	30	0.66223	83.03	40	3	3	12.99430	99.96
38	31	31	0.61160	80.47	40	4	4	9.61688	99.92
38	31	32	0.61160	77.96	40	5	5	7.58946	99.86
38	31	33	0.61160	75.60	40	6	6	6.23702	99.79
38	31	34	0.61160	73.37	40	7	7	5.27024	99.71
38	31	35	0.61160	71.28	40	8	8	4.54447	99.60
38	31	36	0.61160	69.30	40	9	9	3.97934	99.48
38	31	37	0.61160	67.42	40	10	10	3.52664	99.34
38	31	38	0.61160	65.65	40	11	11	3.15568	99.17
39	1	1	39.00000	100.00	40	12	12	2.84599	98.99
39	2	2	19.24675	99.98	40	13	13	2.58340	98.77
39	3	3	12.66082	99.95	40	14	14	2.35780	98.52
39	4	4	9.36666	99.91	40	15	15	2.16177	98.24
39	5	5	7.38918	99.85	40	16	16	1.98971	97.93
39	6	6	6.06999	99.78	40	17	17	1.83739	97.58
39	7	7	5.12695	99.69	40	18	18	1.70146	97.18
39	8	8	4.41896	99.58	40	19	19	1.57932	96.74
39	9	9	3.86764	99.45	40	20	20	1.46885	96.24

N	K	M	C(K,N)	EFF.	N	K	M	C(K,N)	EFF.
40	21	21	1.36836	95.68	40	31	31	0.68986	84.23
40	22	22	1.27643	95.05	40	32	32	0.64074	82.00
40	23	23	1.19191	94.35	40	32	33	0.64074	79.52
40	24	24	1.11382	93.56	40	32	34	0.64074	77.18
40	25	25	1.04133	92.68	40	32	35	0.64074	74.97
40	26	26	0.97373	91.68	40	32	36	0.64074	72.89
40	27	27	0.91041	90.55	40	32	37	0.64074	70.92
40	28	28	0.85082	89.27	40	32	38	0.64074	69.06
40	29	29	0.79449	87.81	40	32	39	0.64074	67.28
40	30	30	0.74097	86.14	40	32	40	0.64074	65.60

Table D3

MOST EFFICIENT UNBIASED POINT ESTIMATORS FOR TWO PARAMETERS, BASED ON TWO ORDER STATISTICS OF A TWO-PARAMETER EXPONENTIAL POPULATION

[**Estimator of location parameter** α : $\tilde{\alpha} = c_{\alpha l} x_l + c_{\alpha m} x_m$; **estimator of scale parameter** σ : $\tilde{\sigma} = c_{\sigma l} x_l + c_{\sigma m} x_m$; **estimator of mean** μ : $\tilde{\mu} = c_{\mu l} x_l + c_{\mu m} x_m$, **where** $c_{\alpha l} = 1 + c_\alpha$, $c_{\alpha m} = -c_\alpha$; $c_{\sigma l} = -c_\sigma$, $c_{\sigma m} = c_\sigma$; $c_{\mu l} = 1 + c_\alpha - c_\sigma$, $c_{\mu m} = c_\sigma - c_\alpha$]

Best Estimators from 2 Order Statistics x_1, x_m of Parameters α, σ and Mean μ of 2-Parameter Exponential Population

n	m	c_α	c_σ	$V_{\tilde{\alpha}}/\sigma^2$	$E_{\tilde{\alpha}}$(%)	$V_{\tilde{\sigma}}/\sigma^2$	$E_{\tilde{\sigma}}$(%)	$V_{\tilde{\mu}}/\sigma^2$	$E_{\tilde{\mu}}$(%)
2	2	.500000	1.00000	.5000000	100.00	1.000000	100.00	.5000000	100.00
3	3	.222222	.666667	.1728395	96.429	.5555556	90.000	.3580247	93.103
4	4	.136364	.545455	.08780992	94.902	.4049587	82.313	.2902893	86.121
5	5	.096000	.480000	.05312000	94.127	.3280000	76.220	.2499200	80.026
6	6	.072993	.437956	.03557580	93.697	.2807289	71.243	.2227284	74.830
7	6	.098522	.689655	.02517789	94.565	.2337165	71.311	.1921182	74.359
8	7	.078475	.627803	.01877684	95.102	.2017178	70.820	.1700652	73.501
9	8	.064680	.582121	.01455215	95.442	.1787246	69.940	.1535601	72.357
10	9	.054676	.546756	.01161360	95.673	.1613595	68.859	.1407012	71.073
11	9	.063619	.699806	.009477724	95.919	.1468046	68.118	.1295906	70.151
12	10	.054829	.657948	.007870456	96.256	.1333457	68.175	.1189919	70.033
13	11	.047981	.623748	.006642280	96.507	.1225454	68.002	.1103346	69.718
14	12	.042514	.595191	.005682027	96.700	.1136773	67.668	.1031197	69.268
15	13	.038061	.570919	.004916701	96.852	.1062578	67.222	.0970068	68.724
16	13	.042091	.673448	.004294816	97.016	.0994728	67.020	.0913336	68.430
17	14	.038015	.646247	.003782806	97.189	.0932310	67.038	.0860455	68.363
18	15	.034588	.622580	.003357619	97.330	.0878686	66.945	.0814630	68.197
19	16	.031672	.601766	.003000580	97.447	.0832093	66.766	.0774510	67.955
20	17	.029165	.583292	.002697803	97.545	.0791212	66.520	.0739069	67.653
21	17	.031444	.660325	.002438181	97.653	.0752377	66.456	.0705104	67.535
22	18	.029100	.640195	.002214152	97.758	.0716497	66.461	.0673502	67.490
23	19	.027047	.622092	.002019763	97.847	.0684545	66.401	.0645217	67.385
24	20	.025238	.605709	.001849983	97.925	.0655900	66.288	.0619741	67.232
25	21	.023632	.590798	.001700810	97.993	.0630065	66.131	.0596668	67.039
26	21	.025095	.652475	.001568788	98.067	.0605006	66.115	.0574155	66.988
27	22	.023574	.636502	.001451542	98.137	.0581740	66.115	.0553164	66.955
28	23	.022209	.621843	.001347010	98.199	.0560557	66.072	.0533987	66.882
29	24	.020977	.608333	.001253411	98.254	.0541184	65.993	.0516395	66.776
30	25	.019861	.595834	.001169266	98.303	.0523395	65.883	.0500195	66.641
31	25	.020879	.647255	.001093227	98.357	.0505915	65.887	.0484208	66.620
32	26	.019813	.634017	.001024377	98.408	.0489616	65.884	.0469259	66.594
33	27	.018839	.621699	.000961850	98.453	.0474551	65.852	.0455408	66.540
34	28	.017947	.610203	.000904895	98.494	.0460582	65.793	.0442538	66.462
35	29	.017127	.599445	.000852865	98.531	.0447593	65.711	.0430545	66.361
36	29	.017876	.643532	.000805148	98.572	.0434715	65.724	.0418616	66.356
37	30	.017087	.632230	.000761334	98.610	.0422665	65.721	.0407431	66.335
38	31	.016358	.621609	.000721011	98.644	.0411405	65.694	.0396962	66.293
39	32	.015682	.611604	.000683817	98.676	.0400859	65.649	.0387140	66.232
40	32	.016279	.651175	.000649434	98.705	.0390941	65.588	.0377889	66.157
41	33	.015628	.640744	.000617554	98.737	.0381083	65.602	.0368669	66.158
42	34	.015021	.630885	.000587971	98.767	.0371813	65.598	.0359988	66.140
43	35	.014455	.621548	.000560469	98.794	.0363080	65.577	.0351797	66.106
44	36	.013925	.612692	.000534857	98.819	.0354837	65.539	.0344057	66.057
45	36	.014395	.647770	.000510963	98.843	.0346995	65.497	.0336683	66.003
46	37	.013882	.638578	.000488621	98.868	.0339230	65.508	.0329368	66.003
47	38	.013401	.629835	.000467717	98.892	.0331879	65.503	.0322434	65.987
48	39	.012948	.621506	.000448130	98.914	.0324909	65.485	.0315852	65.959
49	40	.012522	.613562	.000429750	98.934	.0318289	65.454	.0309596	65.919
50	40	.012901	.645063	.000412477	98.954	.0311934	65.425	.0303581	65.880

Best Estimators from 2 Order Statistics x_1, x_m of Parameters α, σ and Mean μ of 2-Parameter Exponential Population

n	m	c_α	c_σ	$V_{\tilde{\alpha}}/\sigma^2$	$E_{\tilde{\alpha}}$(%)	$V_{\tilde{\sigma}}/\sigma^2$	$E_{\tilde{\sigma}}$(%)	$V_{\tilde{\mu}}/\sigma^2$	$E_{\tilde{\mu}}$(%)
51	41	.012487	.636847	.000396219	98.975	.0305661	65.432	.0297636	65.879
52	42	.012096	.628992	.000380906	98.994	.0299689	65.427	.0291971	65.865
53	43	.011726	.621475	.000366465	99.012	.0293996	65.412	.0286567	65.841
54	44	.011375	.614272	.000352831	99.029	.0288564	65.385	.0281405	65.807
55	44	.011688	.642858	.000339944	99.046	.0283310	65.365	.0276407	65.779
56	45	.011347	.635431	.000327747	99.063	.0278136	65.370	.0271480	65.777
57	46	.011023	.628302	.000316195	99.079	.0273189	65.366	.0266765	65.765
58	47	.010715	.621452	.000305245	99.094	.0268453	65.352	.0262249	65.744
59	48	.010421	.614864	.000294855	99.109	.0263915	65.329	.0257918	65.715
60	48	.010684	.641029	.000284986	99.123	.0259499	65.315	.0253699	65.695
61	49	.010398	.634253	.000275602	99.137	.0255159	65.319	.0249549	65.692
62	50	.010125	.627726	.000266675	99.151	.0250994	65.314	.0245564	65.682
63	51	.009864	.621434	.000258176	99.164	.0246992	65.302	.0241733	65.663
64	52	.009615	.615364	.000250077	99.176	.0243145	65.282	.0238047	65.638
65	52	.009838	.639486	.000242352	99.188	.0239381	65.272	.0234439	65.623
66	53	.009595	.633256	.000234979	99.200	.0235689	65.275	.0230896	65.620
67	54	.009362	.627237	.000227938	99.212	.0232133	65.271	.0227483	65.611
68	55	.009139	.621420	.000221209	99.223	.0228708	65.260	.0224193	65.595
69	56	.008925	.615792	.000214774	99.234	.0225404	65.242	.0221018	65.573
70	56	.009117	.638167	.000208615	99.244	.0222159	65.236	.0217897	65.562
71	57	.008907	.632402	.000202717	99.255	.0218979	65.238	.0214838	65.559
72	58	.008706	.626818	.000197066	99.265	.0215909	65.234	.0211882	65.550
73	59	.008512	.621409	.000191648	99.275	.0212943	65.224	.0209025	65.536
74	60	.008327	.616164	.000186451	99.284	.0210076	65.208	.0206263	65.516
75	60	.008494	.637027	.000181462	99.294	.0207248	65.204	.0203536	65.508
76	61	.008311	.631662	.000176670	99.303	.0204481	65.206	.0200867	65.505
77	62	.008136	.626455	.000172066	99.312	.0201804	65.201	.0198283	65.497
78	63	.007967	.621399	.000167640	99.320	.0199211	65.192	.0195779	65.484
79	64	.007804	.616488	.000163382	99.328	.0196699	65.178	.0193353	65.467
80	64	.007950	.636031	.000159285	99.337	.0194214	65.177	.0190951	65.462
81	65	.007790	.631015	.000155339	99.345	.0191784	65.177	.0188602	65.459
82	66	.007636	.626137	.000151538	99.353	.0189428	65.173	.0186324	65.451
83	67	.007487	.621392	.000147875	99.360	.0187143	65.165	.0184112	65.440
84	68	.007343	.616774	.000144344	99.367	.0184924	65.152	.0181964	65.424
85	68	.007472	.635155	.000140937	99.375	.0182722	65.152	.0179832	65.420
86	69	.007331	.630444	.000137650	99.382	.0180572	65.152	.0177749	65.418
87	70	.007194	.625856	.000134476	99.389	.0178483	65.149	.0175725	65.411
88	71	.007061	.621386	.000131411	99.396	.0176453	65.141	.0173756	65.400
89	72	.006933	.617029	.000128449	99.402	.0174478	65.129	.0171842	65.385
90	72	.007049	.634377	.000125587	99.409	.0172515	65.130	.0169937	65.384
91	73	.006922	.629936	.000122818	99.415	.0170598	65.130	.0168077	65.381
92	74	.006800	.625606	.000120141	99.421	.0168733	65.127	.0166266	65.374
93	75	.006682	.621380	.000117550	99.427	.0166918	65.119	.0164503	65.364
94	76	.006567	.617256	.000115042	99.433	.0165150	65.109	.0162786	65.351
95	76	.006670	.633682	.000112614	99.439	.0163387	65.111	.0161074	65.351
96	77	.006557	.629483	.000110261	99.445	.0161668	65.111	.0159403	65.348
97	78	.006447	.625382	.000107982	99.451	.0159993	65.107	.0157774	65.342
98	79	.006341	.621376	.000105772	99.456	.0158360	65.100	.0156186	65.333
99	79	.006436	.637131	.000103630	99.461	.0156767	65.091	.0154636	65.321
100	80	.006331	.633057	.000101552	99.467	.0155177	65.093	.0153089	65.321

Table D4

MOST EFFECTIVE (EFFICIENT) INTERVAL ESTIMATORS FOR σ, BASED ON ONE ORDER STATISTIC OF A SAMPLE FROM A ONE-PARAMETER EXPONENTIAL POPULATION

[Upper and lower $(1-P)$ confidence bounds, B_{um} and B_{lm}, of central $(1-2P)$ confidence interval, based on mth order statistic, x_m, of sample of size n]

F_u = Effectiveness of Upper Confidence Bound Relative to Conventional Bound
F_i = Effectiveness of Central Confidence Interval Relative to Conventional Interval
S_u = Effectiveness of Upper Confidence Bound Relative to Censored Bound
S_i = Effectiveness of Central Confidence Interval Relative to Censored Interval
E_u = Efficiency of Upper Confidence Bound Relative to Conventional Bound
E_i = Efficiency of Central Confidence Interval Relative to Conventional Interval
R_u = Efficiency of Upper Confidence Bound Relative to Censored Bound
R_i = Efficiency of Central Confidence Interval Relative to Censored Interval

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
1	1	0.9999	9999.500	0.108574	0.9998	100.0	100.0	100.0	100.0
1	1	0.9995	1999.500	0.131563	0.9990	100.0	100.0	100.0	100.0
1	1	0.9990	999.4999	0.144765	0.9980	100.0	100.0	100.0	100.0
1	1	0.9950	199.4996	0.188739	0.9900	100.0	100.0	100.0	100.0
1	1	0.9900	99.49916	0.217147	0.9800	100.0	100.0	100.0	100.0
1	1	0.9750	39.49789	0.271085	0.9500	100.0	100.0	100.0	100.0
1	1	0.9500	19.49573	0.333808	0.9000	100.0	100.0	100.0	100.0
1	1	0.9000	9.491222	0.434294	0.8000	100.0	100.0	100.0	100.0
1	1	0.8000	4.481420	0.621335	0.6000	100.0	100.0	100.0	100.0
1	1	0.7000	2.803673	0.830584	0.4000	100.0	100.0	100.0	100.0
1	1	0.6000	1.957615	1.091357	0.2000	100.0	100.0	100.0	100.0
1	1	0.5000	1.442695			100.0		100.0	
2	2	0.9999	99.49916	0.100975	0.9998	94.3	94.3	94.3	94.3
2	2	0.9995	44.21947	0.120570	0.9990	94.3	94.3	94.3	94.3
2	2	0.9990	31.12010	0.131568	0.9980	94.4	94.3	94.4	94.3
2	2	0.9950	13.63602	0.166939	0.9900	94.5	94.3	94.5	94.3
2	2	0.9900	9.491222	0.188829	0.9800	94.6	94.3	94.6	94.3
2	2	0.9750	5.810219	0.228534	0.9500	94.7	94.3	94.7	94.3
2	2	0.9500	3.951067	0.272025	0.9000	95.0	94.3	95.0	94.3
2	2	0.9000	2.630676	0.336730	0.8000	95.3	94.4	95.3	94.4
2	2	0.8000	1.686956	0.444770	0.6000	95.9	94.4	95.9	94.4
2	2	0.7000	1.260304	0.551900	0.4000	96.4	94.4	96.4	94.4
2	2	0.6000	0.999090	0.671202	0.2000	97.0	94.4	97.0	94.4
2	2	0.5000	0.814367			97.6		97.6	
3	3	0.9999	21.04039	0.097003	0.9998	90.2	90.1	90.2	90.1
3	3	0.9995	12.09232	0.114951	0.9990	90.4	90.1	90.4	90.1
3	3	0.9990	9.491222	0.124906	0.9980	90.5	90.1	90.5	90.1
3	3	0.9950	5.332417	0.156366	0.9900	90.8	90.2	90.8	90.2
3	3	0.9900	4.121388	0.175425	0.9800	91.1	90.2	91.1	90.2
3	3	0.9750	2.891186	0.209245	0.9500	91.5	90.2	91.5	90.2
3	3	0.9500	2.176260	0.245258	0.9000	92.0	90.2	92.0	90.2
3	3	0.9000	1.602776	0.297045	0.8000	92.6	90.2	92.6	90.2
3	3	0.8000	1.137652	0.379433	0.6000	93.7	90.2	93.7	90.2
3	3	0.7000	0.903386	0.456955	0.4000	94.6	90.1	94.6	90.1
3	3	0.6000	0.749139	0.539296	0.2000	95.6	90.1	95.6	90.1
3	3	0.5000	0.633542			96.6		96.6	
4	4	0.9999	9.491222	0.094370	0.9998	87.3	86.9	87.3	86.9
4	4	0.9995	6.173910	0.111272	0.9990	87.6	86.9	87.6	86.9
4	4	0.9990	5.107108	0.120574	0.9980	87.7	86.9	87.7	86.9
4	4	0.9950	3.234883	0.149639	0.9900	88.3	86.9	88.3	86.9
4	4	0.9900	2.630676	0.167009	0.9800	88.7	86.9	88.7	86.9
4	4	0.9750	1.972805	0.197406	0.9500	89.3	86.9	89.3	86.9
4	4	0.9500	1.561745	0.229206	0.9000	90.0	86.9	90.0	86.9
4	4	0.9000	1.210191	0.273987	0.8000	90.9	86.8	90.9	86.8
4	4	0.8000	0.905098	0.343171	0.6000	92.4	86.8	92.4	86.8
4	4	0.7000	0.742174	0.406260	0.4000	93.6	86.8	93.6	86.8
4	4	0.6000	0.630491	0.471432	0.2000	94.8	86.8	94.8	86.8
4	4	0.5000	0.544011			96.1		96.1	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u(%)	F_i(%)	S_u(%)	S_i(%)
5	5	0.9999	5.795202	0.092424	0.9998	85.0	84.2	85.0	84.2
5	5	0.9995	4.052508	0.108576	0.9990	85.4	84.3	85.4	84.3
5	5	0.9990	3.457000	0.117415	0.9980	85.7	84.3	85.7	84.3
5	5	0.9950	2.350046	0.144807	0.9900	86.4	84.2	86.4	84.2
5	5	0.9900	1.969761	0.161015	0.9800	86.9	84.2	86.9	84.2
5	5	0.9750	1.537456	0.189100	0.9500	87.7	84.2	87.7	84.2
5	5	0.9500	1.254847	0.218114	0.9000	88.6	84.1	88.6	84.1
5	5	0.9000	1.003167	0.258376	0.8000	89.7	84.1	89.7	84.1
5	5	0.8000	0.775084	0.319325	0.6000	91.4	84.0	91.4	84.0
5	5	0.7000	0.648595	0.373717	0.4000	92.9	84.0	92.9	84.0
5	4	0.6000	0.992163	0.754215	0.2000	94.7	82.1*	97.8	94.2
5	4	0.5000	0.862837			96.7		98.4	
6	6	0.9999	4.121388	0.090892	0.9998	83.3	82.0	83.3	82.0
6	6	0.9995	3.022012	0.106468	0.9990	83.8	82.0	83.8	82.0
6	6	0.9990	2.630676	0.114954	0.9980	84.1	82.0	84.1	82.0
6	6	0.9950	1.874013	0.141084	0.9900	85.0	82.0	85.0	82.0
6	6	0.9900	1.602776	0.156427	0.9800	85.6	81.9	85.6	81.9
6	6	0.9750	1.285111	0.182811	0.9500	86.5	81.9	86.5	81.9
6	6	0.9500	1.070836	0.209810	0.9000	87.5	81.8	87.5	81.8
6	6	0.9000	0.874523	0.246859	0.8000	88.8	81.7	88.8	81.7
6	5	0.8000	1.160510	0.508397	0.6000	91.3	82.3	96.2	92.5
6	5	0.7000	0.979760	0.586569	0.4000	93.5	82.8	96.9	92.5
6	5	0.6000	0.852532	0.665578	0.2000	95.3	83.0	97.5	92.5
6	5	0.5000	0.751821			97.1		98.2	
7	7	0.9999	3.201607	0.089636	0.9998	81.8	80.1	81.8	80.1
7	7	0.9995	2.427707	0.104749	0.9990	82.5	80.1	82.5	80.1
7	7	0.9990	2.143967	0.112953	0.9980	82.8	80.1	82.8	80.1
7	7	0.9950	1.579244	0.138082	0.9900	83.9	80.0	83.9	80.0
7	7	0.9900	1.370422	0.152747	0.9800	84.5	79.9	84.5	79.9
7	7	0.9750	1.120405	0.177810	0.9500	85.6	79.8*	85.6	79.8
7	6	0.9500	1.532390	0.341250	0.9000	87.3	81.1	94.1	90.9
7	6	0.9000	1.261314	0.393616	0.8000	89.5	81.9	94.7	90.9
7	6	0.8000	1.008139	0.470785	0.6000	92.1	82.7	95.7	90.9
7	6	0.7000	0.863959	0.538095	0.4000	94.0	83.0	96.5	90.9
7	6	0.6000	0.760539	0.605166	0.2000	95.7	83.1	97.3	90.9
7	6	0.5000	0.677386			97.3		98.1	
8	8	0.9999	2.630676	0.088576	0.9998	80.7	78.4	80.7	78.4
8	8	0.9995	2.045421	0.103304	0.9990	81.4	78.4	81.4	78.4
8	8	0.9990	1.825962	0.111275	0.9980	81.8	78.4	81.8	78.4
8	7	0.9950	2.175662	0.233223	0.9900	83.3	79.3	91.9	89.6
8	7	0.9900	1.894905	0.254500	0.9800	84.6	79.9	92.3	89.6
8	7	0.9750	1.558882	0.290142	0.9500	86.5	80.8	92.9	89.5
8	7	0.9500	1.327002	0.325660	0.9000	88.2	81.5	93.5	89.5
8	7	0.9000	1.110127	0.373262	0.8000	90.1	82.0	94.2	89.5
8	7	0.8000	0.902888	0.442520	0.6000	92.5	82.6	95.3	89.5
8	7	0.7000	0.782460	0.502148	0.4000	94.3	82.8	96.2	89.4
8	7	0.6000	0.694828	0.560911	0.2000	95.9	82.9	97.1	89.4
8	6	0.5000	0.878878			97.5		98.9	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
9	9	0.9999	2.245571	0.087661	0.9998	79.7	76.9	79.7	76.9
9	8	0.9995	2.740770	0.179101	0.9990	80.9	77.9	90.3	88.3
9	8	0.9990	2.452161	0.191088	0.9980	81.8	78.5	90.5	88.3
9	8	0.9950	1.864991	0.226624	0.9900	84.2	79.7	91.2	88.3
9	8	0.9900	1.642726	0.246683	0.9800	85.4	80.2	91.6	88.2
9	8	0.9750	1.372153	0.280082	0.9500	87.1	80.9	92.3	88.2
9	8	0.9500	1.182057	0.313124	0.9000	88.7	81.4	93.0	88.2
9	8	0.9000	1.001314	0.357057	0.8000	90.5	81.8	93.8	88.1
9	8	0.8000	0.825468	0.420313	0.6000	92.7	82.2	95.0	88.1
9	8	0.7000	0.721641	0.474202	0.4000	94.4	82.4	96.0	88.1
9	7	0.6000	0.887721	0.721851	0.2000	96.0	81.0*	98.2	93.3
9	7	0.5000	0.799401			97.7		98.8	
10	9	0.9999	2.947923	0.153739	0.9998	80.0	77.3	89.0	87.1
10	9	0.9995	2.347536	0.175598	0.9990	81.8	78.4	89.5	87.1
10	9	0.9990	2.118425	0.187109	0.9980	82.7	78.8	89.8	87.1
10	9	0.9950	1.643984	0.221066	0.9900	84.8	79.8	90.6	87.0
10	9	0.9900	1.460964	0.240127	0.9800	85.9	80.2	91.1	87.0
10	9	0.9750	1.235109	0.271703	0.9500	87.5	80.7	91.8	87.0
10	9	0.9500	1.074125	0.302752	0.9000	89.0	81.1	92.5	86.9
10	9	0.9000	0.919013	0.343757	0.8000	90.7	81.4	93.5	86.9
10	9	0.8000	0.765884	0.402287	0.6000	92.9	81.7	94.8	86.9
10	8	0.7000	0.909329	0.607133	0.4000	94.6	81.4*	97.5	92.3
10	8	0.6000	0.816001	0.671425	0.2000	96.3	81.5*	98.1	92.3
10	8	0.5000	0.739333			97.9		98.7	
11	10	0.9999	2.550353	0.151406	0.9998	80.8	77.7	88.3	86.0
11	10	0.9995	2.063467	0.172563	0.9990	82.4	78.5	88.9	86.0
11	10	0.9990	1.874971	0.183669	0.9980	83.2	78.9	89.2	86.0
11	10	0.9950	1.478934	0.216293	0.9900	85.2	79.7	90.1	85.9
11	10	0.9900	1.323778	0.234518	0.9800	86.2	80.0	90.6	85.8
11	10	0.9750	1.130147	0.264576	0.9500	87.8	80.4	91.4	85.8
11	10	0.9500	0.990477	0.293977	0.9000	89.1	80.6	92.1	85.8
11	10	0.9000	0.854410	0.332584	0.8000	90.8	80.9	93.1	85.7
11	9	0.8000	0.952715	0.514005	0.6000	93.1	81.4	96.7	91.4
11	9	0.7000	0.842195	0.573666	0.4000	95.0	81.7	97.4	91.3
11	9	0.6000	0.760095	0.631482	0.2000	96.5	81.8	98.0	91.3
11	9	0.5000	0.692122			98.0		98.7	
12	11	0.9999	2.255961	0.149346	0.9998	81.3	77.8	87.7	85.0
12	11	0.9995	1.849261	0.169894	0.9990	82.8	78.5	88.3	84.9
12	11	0.9990	1.689910	0.180650	0.9980	83.5	78.7	88.6	84.9
12	11	0.9950	1.351016	0.212129	0.9900	85.4	79.4	89.6	84.8
12	11	0.9900	1.216517	0.229641	0.9800	86.4	79.6	90.1	84.8
12	11	0.9750	1.047075	0.258411	0.9500	87.9	79.9*	91.0	84.7
12	11	0.9500	0.923619	0.286423	0.9000	89.2	80.1*	91.8	84.7
12	10	0.9000	1.049144	0.426071	0.8000	91.1	81.1	95.6	90.4
12	10	0.8000	0.886772	0.491465	0.6000	93.5	81.5	96.5	90.4
12	10	0.7000	0.788618	0.546209	0.4000	95.2	81.7	97.3	90.4
12	10	0.6000	0.715134	0.598927	0.2000	96.7	81.8	98.0	90.4
12	9	0.5000	0.825023			98.2		99.1	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
13	12	0.9999	2.029881	0.147507	0.9998	81.6	77.7	87.1	84.0
13	12	0.9995	1.682235	0.167520	0.9990	83.0	78.3	87.8	83.9
13	12	0.9990	1.544630	0.177970	0.9980	83.7	78.5	88.2	83.9
13	12	0.9950	1.248943	0.208452	0.9900	85.6	79.0*	89.2	83.8
13	12	0.9900	1.130291	0.225345	0.9800	86.5	79.2*	89.7	83.7
13	11	0.9750	1.268036	0.334656	0.9500	88.2	80.2	94.0	89.6
13	11	0.9500	1.121884	0.368006	0.9000	89.7	80.7	94.6	89.6
13	11	0.9000	0.978212	0.411445	0.8000	91.5	81.1	95.3	89.6
13	11	0.8000	0.833211	0.472453	0.6000	93.7	81.5	96.3	89.5
13	11	0.7000	0.744749	0.523193	0.4000	95.3	81.7	97.1	89.5
13	11	0.6000	0.678079	0.571790	0.2000	96.8	81.8	97.9	89.5
13	10	0.5000	0.775205			98.3		99.1	
14	13	0.9999	1.851142	0.145849	0.9998	81.8	77.5	86.6	83.1
14	13	0.9995	1.548457	0.165387	0.9990	83.2	78.0	87.3	83.0
14	13	0.9990	1.427597	0.175566	0.9980	83.8	78.1*	87.7	82.9
14	12	0.9950	1.495147	0.273156	0.9900	85.8	79.3	92.7	88.8
14	12	0.9900	1.355763	0.293296	0.9800	86.9	79.8	93.1	88.8
14	12	0.9750	1.178786	0.326094	0.9500	88.6	80.3	93.7	88.8
14	12	0.9500	1.048767	0.357757	0.9000	90.0	80.7	94.3	88.7
14	12	0.9000	0.919932	0.398814	0.8000	91.8	81.1	95.1	88.7
14	12	0.8000	0.788749	0.456148	0.6000	93.9	81.4	96.2	88.7
14	12	0.7000	0.708079	0.503560	0.4000	95.5	81.5	97.0	88.7
14	11	0.6000	0.798285	0.676158	0.2000	97.0	81.0*	98.5	92.3
14	11	0.5000	0.734080			98.4		99.0	
15	14	0.9999	1.706449	0.144344	0.9998	81.9	77.2*	86.2	82.2
15	13	0.9995	1.833879	0.220180	0.9990	83.3	78.2	91.3	88.1
15	13	0.9990	1.692871	0.232450	0.9980	84.1	78.6	91.6	88.1
15	13	0.9950	1.387217	0.267782	0.9900	86.3	79.4	92.4	88.0
15	13	0.9900	1.263430	0.287130	0.9800	87.3	79.8	92.8	88.0
15	13	0.9750	1.105156	0.318540	0.9500	88.9	80.3	93.5	87.9
15	13	0.9500	0.988009	0.348749	0.9000	90.3	80.6	94.1	87.9
15	13	0.9000	0.871119	0.387765	0.8000	91.9	80.9	94.9	87.9
15	13	0.8000	0.751176	0.441972	0.6000	94.0	81.2	96.0	87.9
15	12	0.7000	0.828123	0.594566	0.4000	95.6	81.1*	97.9	91.6
15	12	0.6000	0.758287	0.646176	0.2000	97.1	81.2*	98.4	91.6
15	11	0.5000	0.841029			98.5		99.3	
16	14	0.9999	2.005152	0.193769	0.9998	82.1	77.6	90.4	87.4
16	14	0.9995	1.695043	0.216892	0.9990	83.8	78.4	91.0	87.3
16	14	0.9990	1.570296	0.228792	0.9980	84.6	78.7	91.2	87.3
16	14	0.9950	1.297775	0.262963	0.9900	86.6	79.5	92.1	87.2
16	14	0.9900	1.186488	0.281616	0.9800	87.6	79.8	92.5	87.2
16	14	0.9750	1.043321	0.311808	0.9500	89.2	80.2	93.2	87.2
16	14	0.9500	0.936661	0.340749	0.9000	90.5	80.4	93.9	87.1
16	14	0.9000	0.829582	0.377993	0.8000	92.1	80.7	94.8	87.1
16	13	0.8000	0.872865	0.521712	0.6000	94.2	81.1	97.1	90.9
16	13	0.7000	0.788504	0.572361	0.4000	95.8	81.3	97.8	90.9
16	13	0.6000	0.724240	0.620435	0.2000	97.2	81.4	98.4	90.9
16	12	0.5000	0.798618			98.6		99.3	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
17	15	0.9999	1.855646	0.191376	0.9998	82.6	77.8	90.0	86.6
17	15	0.9995	1.579822	0.213903	0.9990	84.2	78.5	90.6	86.6
17	15	0.9990	1.468123	0.225474	0.9980	84.9	78.7	90.9	86.6
17	15	0.9950	1.222420	0.258609	0.9900	86.9	79.4	91.8	86.5
17	15	0.9900	1.121347	0.276643	0.9800	87.9	79.6	92.2	86.5
17	15	0.9750	0.990611	0.305758	0.9500	89.3	80.0*	93.0	86.4
17	15	0.9500	0.892645	0.333581	0.9000	90.6	80.2*	93.7	86.4
17	14	0.9000	0.957399	0.447099	0.8000	92.3	80.8	96.1	90.3
17	14	0.8000	0.832352	0.505315	0.6000	94.4	81.1	97.0	90.3
17	14	0.7000	0.754460	0.552980	0.4000	95.9	81.3	97.7	90.3
17	14	0.6000	0.694857	0.598052	0.2000	97.3	81.4	98.3	90.3
17	13	0.5000	0.762453			98.6		99.2	
18	16	0.9999	1.730698	0.189181	0.9998	83.0	77.9	89.7	86.0
18	16	0.9995	1.482686	0.211170	0.9990	84.5	78.4	90.3	85.9
18	16	0.9990	1.381653	0.222443	0.9980	85.2	78.7	90.6	85.9
18	16	0.9950	1.158040	0.254647	0.9900	87.1	79.2	91.5	85.8
18	16	0.9900	1.065450	0.272127	0.9800	88.1	79.5*	92.0	85.8
18	15	0.9750	1.134481	0.363976	0.9500	89.5	80.1	94.8	89.7
18	15	0.9500	1.024211	0.395328	0.9000	90.9	80.5	95.3	89.7
18	15	0.9000	0.912925	0.435503	0.8000	92.5	80.8	96.0	89.6
18	15	0.8000	0.797279	0.490796	0.6000	94.6	81.1	96.9	89.6
18	15	0.7000	0.724847	0.535883	0.4000	96.1	81.3	97.6	89.6
18	14	0.6000	0.787487	0.679805	0.2000	97.4	80.8*	98.7	92.3
18	14	0.5000	0.731197			98.7		99.2	
19	17	0.9999	1.624765	0.187158	0.9998	83.3	77.8	89.4	85.3
19	17	0.9995	1.399692	0.208657	0.9990	84.7	78.4	90.0	85.2
19	17	0.9990	1.307514	0.219659	0.9980	85.4	78.6	90.3	85.2
19	17	0.9950	1.102371	0.251020	0.9900	87.3	79.0*	91.3	85.1
19	16	0.9900	1.213796	0.324908	0.9800	88.3	79.7	94.0	89.1
19	16	0.9750	1.078882	0.356544	0.9500	89.8	80.2	94.6	89.1
19	16	0.9500	0.977280	0.386644	0.9000	91.1	80.5	95.2	89.0
19	16	0.9000	0.874242	0.425100	0.8000	92.7	80.8	95.9	89.0
19	16	0.8000	0.766582	0.477829	0.6000	94.7	81.1	96.8	89.0
19	15	0.7000	0.818087	0.608666	0.4000	96.1	80.9*	98.2	91.8
19	15	0.6000	0.756412	0.655755	0.2000	97.5	81.0*	98.7	91.8
19	14	0.5000	0.815108			98.8		99.4	
20	18	0.9999	1.533835	0.185284	0.9998	83.5	77.8	89.1	84.6
20	18	0.9995	1.327954	0.206334	0.9990	84.9	78.2*	89.7	84.6
20	18	0.9990	1.243230	0.217089	0.9980	85.6	78.4*	90.1	84.5
20	17	0.9950	1.250475	0.300207	0.9900	87.6	79.5	93.4	88.5
20	17	0.9900	1.155046	0.319249	0.9800	88.6	79.8	93.8	88.5
20	17	0.9750	1.030490	0.349790	0.9500	90.0	80.2	94.4	88.5
20	17	0.9500	0.936249	0.378773	0.9000	91.3	80.5	95.0	88.4
20	17	0.9000	0.840256	0.415701	0.8000	92.9	80.7	95.7	88.4
20	17	0.8000	0.739461	0.466161	0.6000	94.8	81.0	96.7	88.4
20	16	0.7000	0.786774	0.590012	0.4000	96.3	81.0*	98.1	91.2
20	16	0.6000	0.729065	0.634461	0.2000	97.6	81.1*	98.7	91.2
20	15	0.5000	0.782936			98.8		99.4	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
22	19	0.9999	1.633258	0.222895	0.9998	83.9	78.0	91.3	87.5
22	19	0.9995	1.422825	0.246148	0.9990	85.5	78.6	91.9	87.4
22	19	0.9990	1.335863	0.257958	0.9980	86.2	78.9	92.2	87.4
22	19	0.9950	1.140511	0.291350	0.9900	88.1	79.5	93.0	87.4
22	19	0.9900	1.058338	0.309288	0.9800	89.0	79.7	93.4	87.3
22	19	0.9750	0.950269	0.337944	0.9500	90.4	80.0*	94.1	87.3
22	19	0.9500	0.867838	0.365016	0.9000	91.6	80.3*	94.7	87.3
22	18	0.9000	0.904556	0.462181	0.8000	93.1	80.7	96.5	90.2
22	18	0.8000	0.800424	0.515348	0.6000	95.1	81.0	97.4	90.2
22	18	0.7000	0.734334	0.558256	0.4000	96.5	81.1	98.0	90.2
22	17	0.6000	0.780078	0.682688	0.2000	97.7	80.6*	98.9	92.3
22	17	0.5000	0.729377			98.9		99.4	
24	21	0.9999	1.480046	0.218376	0.9998	84.5	78.1	90.9	86.4
24	21	0.9995	1.299520	0.240663	0.9990	86.0	78.6	91.5	86.4
24	21	0.9990	1.224348	0.251950	0.9980	86.6	78.8	91.8	86.3
24	21	0.9950	1.054133	0.283750	0.9900	88.4	79.3*	92.6	86.3
24	21	0.9900	0.981925	0.300767	0.9800	89.3	79.5*	93.1	86.3
24	20	0.9750	1.016340	0.378702	0.9500	90.7	80.2	95.2	89.2
24	20	0.9500	0.931525	0.407375	0.9000	92.0	80.4	95.7	89.2
24	20	0.9000	0.844192	0.443635	0.8000	93.4	80.7	96.4	89.2
24	20	0.8000	0.751366	0.492735	0.6000	95.3	80.9	97.2	89.2
24	19	0.7000	0.784638	0.602885	0.4000	96.6	80.8*	98.3	91.4
24	19	0.6000	0.731876	0.644422	0.2000	97.8	80.9*	98.8	91.4
24	18	0.5000	0.772545			99.0		99.5	
26	23	0.9999	1.359356	0.214399	0.9998	84.9	78.1*	90.5	85.4
26	23	0.9995	1.201441	0.235854	0.9990	86.3	78.5*	91.1	85.4
26	23	0.9990	1.135260	0.246693	0.9980	86.9	78.7*	91.4	85.3
26	22	0.9950	1.121519	0.320166	0.9900	88.8	79.6	93.9	88.3
26	22	0.9900	1.047435	0.338253	0.9800	89.7	79.8	94.3	88.3
26	22	0.9750	0.949123	0.366976	0.9500	91.1	80.1	94.9	88.3
26	22	0.9500	0.873405	0.393935	0.9000	92.3	80.4	95.5	88.3
26	21	0.9000	0.896438	0.482693	0.8000	93.6	80.6*	96.9	90.6
26	21	0.8000	0.801204	0.533849	0.6000	95.4	80.8	97.7	90.6
26	21	0.7000	0.740143	0.574802	0.4000	96.8	81.0	98.3	90.5
26	21	0.6000	0.692415	0.612826	0.2000	97.9	81.0	98.8	90.5
26	19	0.5000	0.810547			99.1		99.5	
28	24	0.9999	1.431924	0.245342	0.9998	85.3	78.4	92.0	87.5
28	24	0.9995	1.270901	0.268334	0.9990	86.7	78.9	92.6	87.5
28	24	0.9990	1.203231	0.279909	0.9980	87.4	79.1	92.9	87.5
28	24	0.9950	1.048515	0.312305	0.9900	89.2	79.6	93.7	87.4
28	24	0.9900	0.982206	0.329524	0.9800	90.0	79.8*	94.1	87.4
28	24	0.9750	0.893769	0.356792	0.9500	91.3	80.0*	94.7	87.4
28	23	0.9500	0.925437	0.429916	0.9000	92.5	80.4	96.2	89.7
28	23	0.9000	0.845026	0.465383	0.8000	93.9	80.6	96.8	89.7
28	23	0.8000	0.758737	0.513062	0.6000	95.6	80.9	97.6	89.7
28	23	0.7000	0.703098	0.551063	0.4000	96.9	80.9	98.2	89.7
28	22	0.6000	0.733611	0.651911	0.2000	98.0	80.8*	99.0	91.6
28	21	0.5000	0.765155			99.1		99.5	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i(%)	S_u(%)	S_i (%)
30	26	0.9999	1.331245	0.240983	0.9998	85.7	78.4	91.7	86.7
30	26	0.9995	1.187769	0.263146	0.9990	87.1	78.8*	92.3	86.7
30	26	0.9990	1.127161	0.274279	0.9980	87.7	79.0*	92.6	86.6
30	26	0.9950	0.987834	0.305356	0.9900	89.4	79.4*	93.4	86.6
30	25	0.9900	1.035766	0.361724	0.9800	90.3	79.9	94.9	89.0
30	25	0.9750	0.945340	0.390291	0.9500	91.6	80.2	95.5	89.0
30	25	0.9500	0.875155	0.416965	0.9000	92.7	80.4	96.0	88.9
30	25	0.9000	0.801920	0.450391	0.8000	94.1	80.6	96.7	88.9
30	24	0.8000	0.800851	0.548396	0.6000	95.8	80.7*	97.9	90.8
30	24	0.7000	0.743887	0.587613	0.4000	97.0	80.8*	98.5	90.8
30	24	0.6000	0.699093	0.623834	0.2000	98.1	80.9*	98.9	90.8
30	22	0.5000	0.798347			99.2		99.6	
32	28	0.9999	1.247588	0.237062	0.9998	86.1	78.3*	91.4	85.9
32	28	0.9995	1.118229	0.258492	0.9990	87.4	78.7*	92.0	85.8
32	27	0.9990	1.182691	0.303082	0.9980	88.0	79.2	93.6	88.3
32	27	0.9950	1.040594	0.335733	0.9900	89.7	79.7	94.4	88.2
32	27	0.9900	0.979187	0.352999	0.9800	90.6	79.9	94.7	88.2
32	27	0.9750	0.896772	0.380224	0.9500	91.8	80.1*	95.3	88.2
32	27	0.9500	0.832521	0.405574	0.9000	92.9	80.3*	95.9	88.2
32	26	0.9000	0.844328	0.482919	0.8000	94.3	80.6	97.1	90.1
32	26	0.8000	0.763488	0.529213	0.6000	95.9	80.8	97.8	90.1
32	26	0.7000	0.710993	0.565898	0.4000	97.1	80.9	98.4	90.1
32	25	0.6000	0.734721	0.657776	0.2000	98.2	80.7*	99.1	91.7
32	24	0.5000	0.759630			99.2		99.6	
34	29	0.9999	1.304359	0.263372	0.9998	86.4	78.6	92.6	87.6
34	29	0.9995	1.172722	0.285958	0.9990	87.7	79.0	93.1	87.5
34	29	0.9990	1.116753	0.297258	0.9980	88.4	79.2	93.4	87.5
34	29	0.9950	0.987200	0.328650	0.9900	90.0	79.6*	94.2	87.5
34	29	0.9900	0.930945	0.345207	0.9800	90.8	79.8*	94.5	87.5
34	28	0.9750	0.940470	0.409567	0.9500	92.0	80.2	95.9	89.4
34	28	0.9500	0.874911	0.435872	0.9000	93.1	80.4	96.4	89.4
34	28	0.9000	0.806087	0.468692	0.8000	94.4	80.6	97.0	89.4
34	28	0.8000	0.731322	0.512404	0.6000	96.0	80.8	97.8	89.4
34	27	0.7000	0.746381	0.597874	0.4000	97.2	80.8*	98.6	91.0
34	27	0.6000	0.704060	0.632517	0.2000	98.3	80.8*	99.1	91.0
34	25	0.5000	0.789085			99.3		99.6	
36	31	0.9999	1.231646	0.259203	0.9998	86.7	78.6*	92.3	86.9
36	31	0.9995	1.111570	0.281069	0.9990	88.0	79.0*	92.9	86.8
36	31	0.9990	1.060322	0.291989	0.9980	88.6	79.1*	93.2	86.8
36	30	0.9950	1.031931	0.355450	0.9900	90.2	79.8	94.9	88.8
36	30	0.9900	0.974643	0.372669	0.9800	91.0	79.9	95.2	88.8
36	30	0.9750	0.897353	0.399724	0.9500	92.3	80.2	95.8	88.8
36	30	0.9500	0.836759	0.424820	0.9000	93.3	80.4	96.3	88.8
36	30	0.9000	0.772922	0.456054	0.8000	94.6	80.5*	96.9	88.7
36	29	0.8000	0.766625	0.542415	0.6000	96.1	80.7	98.0	90.4
36	29	0.7000	0.716834	0.577885	0.4000	97.3	80.8	98.6	90.4
36	28	0.6000	0.735442	0.662513	0.2000	98.3	80.6*	99.2	91.8
36	27	0.5000	0.755342			99.3		99.6	

A. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
38	33	0.9999	1.169119	0.255393	0.9998	87.0	78.6*	92.1	86.2
38	32	0.9995	1.157737	0.305457	0.9990	88.2	79.2	93.8	88.2
38	32	0.9990	1.105670	0.316842	0.9980	88.9	79.3	94.0	88.2
38	32	0.9950	0.984449	0.348350	0.9900	90.5	79.7	94.7	88.2
38	32	0.9900	0.931487	0.364904	0.9800	91.3	79.9*	95.1	88.1
38	32	0.9750	0.859813	0.390866	0.9500	92.4	80.1*	95.6	88.1
38	31	0.9500	0.873587	0.451754	0.9000	93.5	80.4	96.7	89.8
38	31	0.9000	0.808551	0.483943	0.8000	94.7	80.6	97.2	89.8
38	31	0.8000	0.737490	0.526622	0.6000	96.3	80.7	98.0	89.8
38	30	0.7000	0.748075	0.606308	0.4000	97.4	80.7*	98.7	91.2
38	30	0.6000	0.707875	0.639558	0.2000	98.4	80.7*	99.1	91.2
38	28	0.5000	0.781813			99.3		99.7	
40	34	0.9999	1.215558	0.278301	0.9998	87.3	78.8	93.0	87.6
40	34	0.9995	1.103409	0.300435	0.9990	88.5	79.2	93.6	87.6
40	34	0.9990	1.055310	0.311453	0.9980	89.1	79.3*	93.8	87.6
40	34	0.9950	0.942943	0.341893	0.9900	90.7	79.7*	94.5	87.5
40	34	0.9900	0.893670	0.357852	0.9800	91.4	79.8*	94.9	87.5
40	33	0.9750	0.896554	0.416292	0.9500	92.6	80.2	96.1	89.2
40	33	0.9500	0.839140	0.441081	0.9000	93.6	80.4	96.6	89.2
40	33	0.9000	0.778377	0.471827	0.8000	94.9	80.6	97.2	89.2
40	32	0.8000	0.768717	0.553447	0.6000	96.4	80.7*	98.2	90.6
40	32	0.7000	0.721278	0.587802	0.4000	97.5	80.8*	98.7	90.6
40	31	0.6000	0.735911	0.666431	0.2000	98.4	80.5*	99.2	91.8
40	29	0.5000	0.806226			99.4		99.7	

B. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, DOES NOT MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND--SEE TABLE D4A

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u (%)	F_i (%)	S_u (%)	S_i (%)
5	5	0.6000	0.559569	0.428851	0.2000	94.3	84.0	94.3	84.0
7	6	0.9750	1.828384	0.302555	0.9500	85.4	80.3	93.6	91.0
9	8	0.6000	0.645221	0.526836	0.2000	96.0	82.5	97.0	88.1
10	9	0.7000	0.674289	0.451711	0.4000	94.5	81.8	95.8	86.8
10	9	0.6000	0.606238	0.499627	0.2000	96.0	81.9	96.8	86.8
12	10	0.9750	1.378577	0.344476	0.9500	87.6	80.0	94.4	90.5
12	10	0.9500	1.211687	0.379810	0.9000	89.2	80.5	94.9	90.5
13	11	0.9950	1.627988	0.279206	0.9900	85.2	79.0	93.1	89.6
13	11	0.9900	1.468685	0.300255	0.9800	86.4	79.6	93.4	89.6
14	12	0.9990	1.842593	0.236511	0.9980	83.5	78.3	92.0	88.9
14	12	0.6000	0.646930	0.548755	0.2000	96.9	81.6	97.8	88.7
15	13	0.9999	2.187085	0.196396	0.9998	81.5	77.3	90.8	88.1
15	13	0.7000	0.676905	0.486571	0.4000	95.6	81.3	96.9	87.9
15	13	0.6000	0.620320	0.528907	0.2000	96.9	81.4	97.8	87.9
17	14	0.9750	1.199072	0.372209	0.9500	89.1	80.0	95.0	90.3
17	14	0.9500	1.078461	0.404975	0.9000	90.6	80.4	95.5	90.3
18	15	0.9900	1.281664	0.331117	0.9800	87.9	79.6	94.2	89.7
18	15	0.6000	0.669201	0.578375	0.2000	97.4	81.3	98.3	89.6
19	16	0.9950	1.317612	0.305226	0.9900	87.2	79.4	93.6	89.1
19	16	0.7000	0.698820	0.520667	0.4000	96.1	81.2	97.6	89.0
19	16	0.6000	0.646573	0.560915	0.2000	97.4	81.3	98.3	89.0
20	17	0.9995	1.582632	0.252492	0.9990	84.7	78.4	92.4	88.6
20	17	0.9990	1.479642	0.264921	0.9980	85.5	78.7	92.6	88.5
20	17	0.7000	0.675737	0.507016	0.4000	96.2	81.1	97.5	88.4
20	17	0.6000	0.626441	0.545295	0.2000	97.5	81.1	98.2	88.4
22	18	0.9750	1.099866	0.392402	0.9500	90.3	80.0	95.4	90.2
22	18	0.9500	1.003299	0.423138	0.9000	91.6	80.4	95.9	90.2
22	18	0.6000	0.683061	0.598356	0.2000	97.7	81.2	98.6	90.2
24	20	0.9950	1.211151	0.329163	0.9900	88.3	79.5	94.2	89.3
24	20	0.9900	1.127156	0.348266	0.9800	89.3	79.8	94.6	89.3
24	20	0.7000	0.692030	0.532142	0.4000	96.6	81.0	97.9	89.2
24	20	0.6000	0.645753	0.568803	0.2000	97.8	81.1	98.6	89.2
26	22	0.9999	1.555456	0.250229	0.9998	84.7	78.2	92.4	88.4
26	22	0.9995	1.372122	0.274169	0.9990	86.2	78.8	92.9	88.4
26	22	0.9990	1.295533	0.286250	0.9980	86.9	79.0	93.2	88.4
26	21	0.9000	0.896438	0.482693	0.8000	93.6	80.6	96.9	90.6
28	23	0.9900	1.103136	0.371585	0.9800	89.9	79.8	95.2	89.8
28	23	0.9750	1.002869	0.401705	0.9500	91.3	80.2	95.7	89.8
28	23	0.6000	0.659424	0.586217	0.2000	98.0	81.0	98.8	89.7

B. VALUE OF m, CHOSEN TO MAXIMIZE EFFECTIVENESS F_i OF CENTRAL CONFIDENCE INTERVAL, DOES NOT MAXIMIZE EFFECTIVENESS F_u OF UPPER CONFIDENCE BOUND--SEE TABLE D4A

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	F_u(%)	F_i(%)	S_u(%)	S_i(%)
30	25	0.9995	1.329477	0.297361	0.9990	86.9	78.9	93.7	89.0
30	25	0.9990	1.260820	0.309568	0.9980	87.6	79.1	93.9	89.0
30	25	0.9950	1.103420	0.343651	0.9900	89.4	79.7	94.6	89.0
30	25	0.8000	0.722905	0.495148	0.6000	95.8	80.8	97.5	88.9
30	25	0.7000	0.671704	0.530678	0.4000	97.0	80.9	98.1	88.9
30	25	0.6000	0.631367	0.563442	0.2000	98.1	80.9	98.7	88.9
32	27	0.9999	1.390009	0.267963	0.9998	86.0	78.5	92.9	88.3
32	27	0.9995	1.244357	0.291357	0.9990	87.4	79.0	93.4	88.3
32	26	0.9750	0.990566	0.420589	0.9500	91.8	80.1	96.1	90.1
32	26	0.9500	0.919078	0.448278	0.9000	92.9	80.4	96.5	90.1
32	26	0.6000	0.669571	0.599678	0.2000	98.2	80.9	98.9	90.1
34	28	0.9950	1.086829	0.363308	0.9900	89.9	79.7	95.1	89.5
34	28	0.9900	1.024403	0.381275	0.9800	90.8	79.9	95.4	89.5
34	28	0.7000	0.682572	0.546928	0.4000	97.2	80.8	98.8	90.4
34	28	0.6000	0.643987	0.578633	0.2000	98.2	80.9	98.9	89.4
36	30	0.9999	1.353606	0.287349	0.9998	86.5	78.6	93.5	88.9
36	30	0.9995	1.220349	0.310958	0.9990	87.9	79.1	94.0	88.8
36	30	0.9990	1.163585	0.322749	0.9980	88.6	79.3	94.2	88.8
36	29	0.9000	0.842850	0.497436	0.8000	94.6	80.6	97.3	90.4
36	29	0.6000	0.677373	0.610420	0.2000	98.3	80.9	99.0	90.4
38	32	0.9999	1.279531	0.282624	0.9998	86.9	78.8	93.2	88.2
38	31	0.9900	1.013717	0.397906	0.9800	91.2	79.9	95.8	89.8
38	31	0.9750	0.935225	0.425858	0.9500	92.4	80.2	96.2	89.8
38	31	0.7000	0.690910	0.560183	0.4000	97.4	80.8	98.5	89.8
38	31	0.6000	0.653898	0.590896	0.2000	98.4	80.8	99.0	89.8
40	33	0.9990	1.146099	0.339744	0.9980	89.0	79.4	94.7	89.3
40	33	0.9950	1.023220	0.372365	0.9900	90.6	79.8	95.3	89.2
40	33	0.9900	0.969437	0.389479	0.9800	91.4	80.0	95.6	89.2
40	33	0.8000	0.711757	0.512485	0.6000	96.3	80.7	97.9	89.2
40	33	0.7000	0.667951	0.544375	0.4000	97.4	80.8	98.5	89.2
40	32	0.6000	0.683540	0.619208	0.2000	98.4	80.8	99.1	90.6

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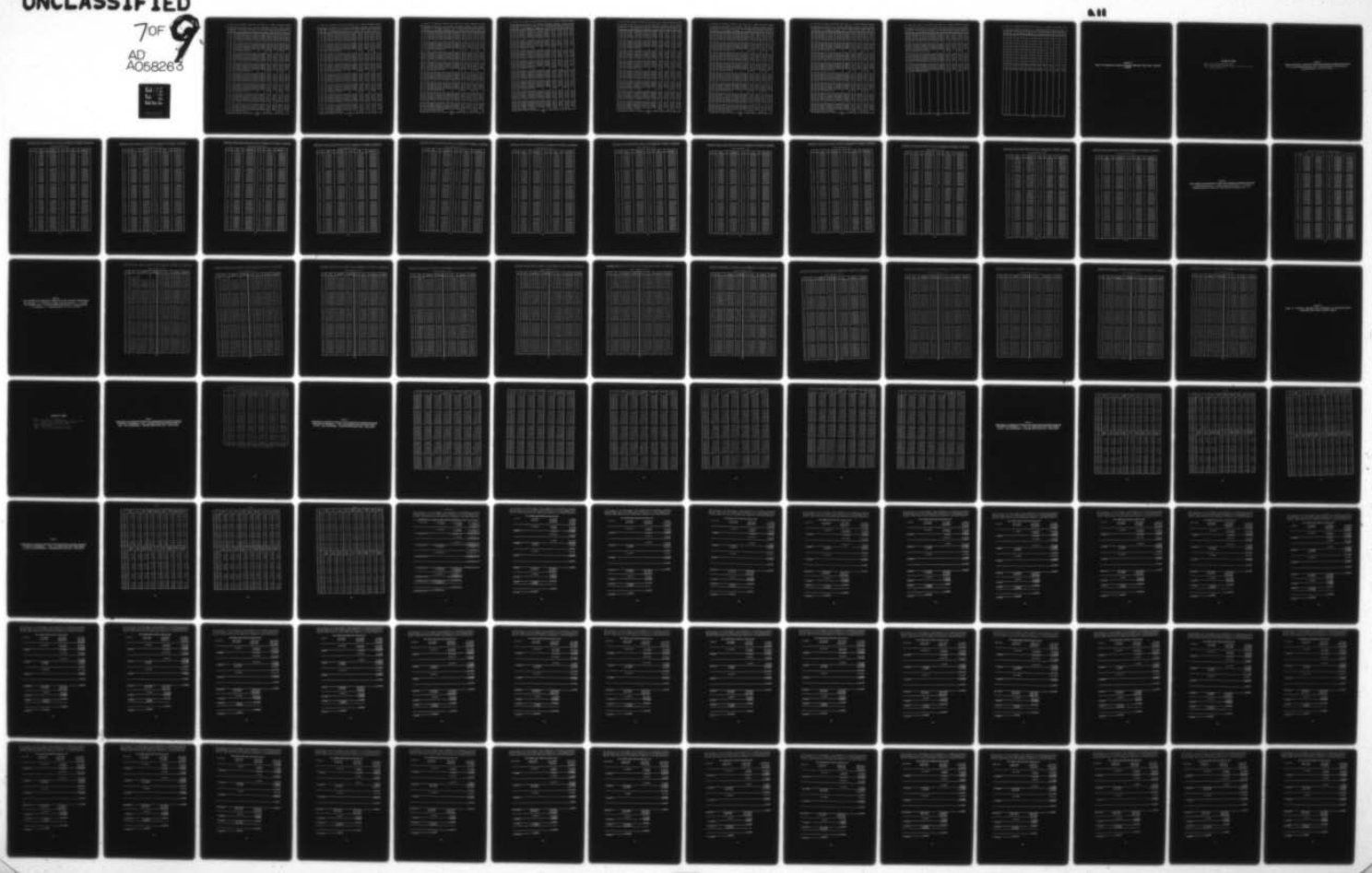

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C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/m	$B_{\ell m}/m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
1	1	0.9999	9999.500	0.108574	0.9998	100.0	100.0	100.0	100.0
1	1	0.9995	1999.500	0.131563	0.9990	100.0	100.0	100.0	100.0
1	1	0.9990	999.4999	0.144765	0.9980	100.0	100.0	100.0	100.0
1	1	0.9950	199.4996	0.188739	0.9900	100.0	100.0	100.0	100.0
1	1	0.9900	99.49916	0.217147	0.9800	100.0	100.0	100.0	100.0
1	1	0.9750	39.49789	0.271085	0.9500	100.0	100.0	100.0	100.0
1	1	0.9500	19.49573	0.333808	0.9000	100.0	100.0	100.0	100.0
1	1	0.9000	9.491222	0.434294	0.8000	100.0	100.0	100.0	100.0
1	1	0.8000	4.481420	0.621335	0.6000	100.0	100.0	100.0	100.0
1	1	0.7000	2.803673	0.830584	0.4000	100.0	100.0	100.0	100.0
1	1	0.6000	1.957615	1.091357	0.2000	100.0	100.0	100.0	100.0
1	1	0.5000	1.442695			100.0		100.0	
2	2	0.9999	99.49916	0.100975	0.9998	85.7	85.7	85.7	85.7
2	2	0.9995	44.21947	0.120570	0.9990	85.7	85.7	85.7	85.7
2	2	0.9990	31.12010	0.131568	0.9980	85.6	85.6	85.6	85.6
2	2	0.9950	13.63602	0.166939	0.9900	85.5	85.5	85.5	85.5
2	2	0.9900	9.491222	0.188829	0.9800	85.5	85.5	85.5	85.5
2	2	0.9750	5.810219	0.228534	0.9500	85.3	85.3	85.3	85.3
2	2	0.9500	3.951067	0.272025	0.9000	85.1	85.2	85.1	85.2
2	2	0.9000	2.630676	0.336730	0.8000	84.8	85.0	84.8	85.0
2	2	0.8000	1.686956	0.444770	0.6000	84.4	84.9	84.4	84.9
2	2	0.7000	1.260304	0.551900	0.4000	84.1	84.9	84.1	84.9
2	2	0.6000	0.999090	0.671202	0.2000	84.3	85.0	84.3	85.0
2	2	0.5000	0.814367			85.0		85.0	
3	3	0.9999	21.04039	0.097003	0.9998	76.8	76.8	76.8	76.8
3	3	0.9995	12.09232	0.114951	0.9990	76.7	76.7	76.7	76.7
3	3	0.9990	9.491222	0.124906	0.9980	76.6	76.6	76.6	76.6
3	3	0.9950	5.332417	0.156366	0.9900	76.4	76.4	76.4	76.4
3	3	0.9900	4.121388	0.175425	0.9800	76.2	76.3	76.2	76.3
3	3	0.9750	2.891186	0.209245	0.9500	75.8	76.1	75.8	76.1
3	3	0.9500	2.176260	0.245258	0.9000	75.5	75.8	75.5	75.8
3	3	0.9000	1.602776	0.297045	0.8000	74.9	75.6	74.9	75.6
3	3	0.8000	1.137652	0.379433	0.6000	74.3	75.5	74.3	75.5
3	3	0.7000	0.903386	0.456955	0.4000	74.0	75.6	74.0	75.6
3	3	0.6000	0.749139	0.539296	0.2000	74.4	75.8	74.4	75.8
3	3	0.5000	0.633542			75.9		75.9	
4	4	0.9999	9.491222	0.094370	0.9998	70.5	70.5	70.5	70.5
4	4	0.9995	6.173910	0.111272	0.9990	70.3	70.3	70.3	70.3
4	4	0.9990	5.107108	0.120574	0.9980	70.1	70.2	70.1	70.2
4	4	0.9950	3.234883	0.149639	0.9900	69.7	69.9	69.7	69.9
4	4	0.9900	2.630676	0.167009	0.9800	69.5	69.7	69.5	69.7
4	4	0.9750	1.972805	0.197406	0.9500	69.0	69.5	69.0	69.5
4	4	0.9500	1.561745	0.229206	0.9000	68.5	69.2	68.5	69.2
4	4	0.9000	1.210191	0.273987	0.8000	67.8	69.0	67.8	69.0
4	4	0.8000	0.905098	0.343171	0.6000	67.1	68.9	67.1	68.9
4	4	0.7000	0.742174	0.406260	0.4000	66.9	69.0	66.9	69.0
4	4	0.6000	0.630491	0.471432	0.2000	67.5	69.3	67.5	69.3
4	4	0.5000	0.544011			69.4		69.4	

C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n		m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
5	5		0.9999	5.795202	0.092424	0.9998	65.6	65.6	65.6	65.6
5	5		0.9995	4.052508	0.108576	0.9990	65.3	65.4	65.3	65.4
5	5		0.9990	3.457000	0.117415	0.9980	65.1	65.3	65.1	65.3
5	5		0.9950	2.350046	0.144807	0.9900	64.6	64.9	64.6	64.9
5	5		0.9900	1.969761	0.161015	0.9800	64.3	64.7	64.3	64.7
5	5		0.9750	1.537456	0.189100	0.9500	63.7	64.4	63.7	64.4
5	5		0.9500	1.254847	0.218114	0.9000	63.2	64.2	63.2	64.2
5	5		0.9000	1.003167	0.258376	0.8000	62.4	64.0	62.4	64.0
5	5		0.8000	0.775084	0.319325	0.6000	61.6	63.9	61.6	63.9
5	5		0.7000	0.648595	0.373717	0.4000	61.4	64.0	61.4	64.0
5	4		0.6000	0.992163	0.754215	0.2000	62.7	65.0	84.4	85.4
5	4		0.5000	0.862837			65.6		85.4	
6	6		0.9999	4.121388	0.090892	0.9998	61.6	61.7	61.6	61.7
6	6		0.9995	3.022012	0.106468	0.9990	61.3	61.5	61.3	61.5
6	6		0.9990	2.630676	0.114954	0.9980	61.1	61.4	61.1	61.4
6	6		0.9950	1.874013	0.141084	0.9900	60.5	61.0	60.5	61.0
6	6		0.9900	1.602776	0.156427	0.9800	60.1	60.8	60.1	60.8
6	6		0.9750	1.285111	0.182811	0.9500	59.5	60.4	59.5	60.4
6	6		0.9500	1.070836	0.209810	0.9000	58.9	60.2	58.9	60.2
6	5		0.9000	1.486492	0.420253	0.8000	58.7	60.7	80.9	81.9
6	5		0.8000	1.160510	0.508397	0.6000	60.5	63.2	80.3	81.8
6	5		0.7000	0.979760	0.586569	0.4000	61.9	64.8	80.2	81.8
6	5		0.6000	0.852532	0.665578	0.2000	63.8	66.0	80.6	81.9
6	5		0.5000	0.751821			66.5		81.9	
7	7		0.9999	3.201607	0.089636	0.9998	58.4	58.5	58.4	58.5
7	7		0.9995	2.427707	0.104749	0.9990	58.0	58.2	58.0	58.2
7	7		0.9990	2.143967	0.112953	0.9980	57.8	58.1	57.8	58.1
7	7		0.9950	1.579244	0.138082	0.9900	57.1	57.7	57.1	57.7
7	7		0.9900	1.370422	0.152747	0.9800	56.7	57.5	56.7	57.5
7	6		0.9750	1.828384	0.302555	0.9500	57.7	59.0	78.5	79.1
7	6		0.9500	1.532390	0.341250	0.9000	58.8	60.5	78.1	78.9
7	6		0.9000	1.261314	0.393616	0.8000	59.9	62.1	77.5	78.7
7	6		0.8000	1.008139	0.470785	0.6000	61.0	63.9	76.9	78.7
7	6		0.7000	0.863959	0.538095	0.4000	62.2	65.1	76.8	78.7
7	6		0.6000	0.760539	0.605166	0.2000	63.8	66.0	77.3	78.8
7	6		0.5000	0.677386			66.3		78.8	
8	8		0.9999	2.630676	0.088576	0.9998	55.6	55.8	55.6	55.8
8	8		0.9995	2.045421	0.103304	0.9990	55.1	55.5	55.1	55.5
8	8		0.9990	1.825962	0.111275	0.9980	54.9	55.4	54.9	55.4
8	7		0.9950	2.175662	0.233223	0.9900	56.7	57.6	76.3	76.6
8	7		0.9900	1.894905	0.254500	0.9800	57.6	58.7	76.0	76.5
8	7		0.9750	1.558882	0.290142	0.9500	58.7	60.1	75.6	76.3
8	7		0.9500	1.327002	0.325660	0.9000	59.4	61.2	75.1	76.1
8	7		0.9000	1.110127	0.373262	0.8000	60.1	62.4	74.5	76.0
8	7		0.8000	0.902888	0.442520	0.6000	60.8	63.8	73.8	75.9
8	7		0.7000	0.782460	0.502148	0.4000	61.7	64.7	73.7	75.9
8	7		0.6000	0.694828	0.560911	0.2000	63.2	65.4	74.4	76.0
8	7		0.5000	0.623520			65.6		76.1	

C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
9	8	0.9999	3.510602	0.156420	0.9998	53.7	54.1	74.6	74.8
9	8	0.9995	2.740770	0.179101	0.9990	55.4	55.9	74.3	74.6
9	8	0.9990	2.452161	0.191088	0.9980	56.0	56.7	74.2	74.5
9	8	0.9950	1.864991	0.226624	0.9900	57.6	58.5	73.7	74.2
9	8	0.9900	1.642726	0.246683	0.9800	58.2	59.3	73.4	74.0
9	8	0.9750	1.372153	0.280082	0.9500	58.9	60.4	72.9	73.8
9	8	0.9500	1.182057	0.313124	0.9000	59.3	61.3	72.4	73.7
9	8	0.9000	1.001314	0.357057	0.8000	59.7	62.2	71.8	73.5
9	8	0.8000	0.825468	0.420313	0.6000	60.2	63.2	71.1	73.4
9	8	0.7000	0.721641	0.474202	0.4000	60.9	64.0	71.0	73.5
9	8	0.6000	0.645221	0.526836	0.2000	62.3	64.5	71.7	73.6
9	8	0.5000	0.582440			64.7		73.6	
10	9	0.9999	2.947923	0.153739	0.9998	54.9	55.3	72.4	72.6
10	9	0.9995	2.347536	0.175598	0.9990	56.1	56.8	72.1	72.4
10	9	0.9990	2.118425	0.187109	0.9980	56.7	57.4	71.9	72.3
10	9	0.9950	1.643984	0.221066	0.9900	57.8	58.8	71.4	72.0
10	9	0.9900	1.460964	0.240127	0.9800	58.2	59.5	71.1	71.8
10	9	0.9750	1.235109	0.271703	0.9500	58.6	60.3	70.6	71.6
10	9	0.9500	1.074125	0.302752	0.9000	58.9	61.0	70.0	71.4
10	9	0.9000	0.919013	0.343757	0.8000	59.1	61.7	69.4	71.3
10	9	0.8000	0.765884	0.402287	0.6000	59.3	62.5	68.6	71.2
10	8	0.7000	0.909329	0.607133	0.4000	60.4	63.5	80.7	82.5
10	8	0.6000	0.816001	0.671425	0.2000	62.2	64.4	81.2	82.5
10	8	0.5000	0.739333			64.7		82.5	
11	10	0.9999	2.550353	0.151406	0.9998	55.5	55.9	70.3	70.6
11	10	0.9995	2.063467	0.172563	0.9990	56.4	57.1	70.0	70.4
11	10	0.9990	1.874971	0.183669	0.9980	56.8	57.6	69.8	70.2
11	10	0.9950	1.478934	0.216293	0.9900	57.6	58.7	69.3	69.9
11	10	0.9900	1.323778	0.234518	0.9800	57.9	59.2	68.9	69.8
11	10	0.9750	1.130147	0.264576	0.9500	58.1	59.9	68.4	69.6
11	10	0.9500	0.990477	0.293977	0.9000	58.3	60.4	67.8	69.4
11	9	0.9000	1.137529	0.443272	0.8000	58.5	61.3	79.2	80.6
11	9	0.8000	0.952715	0.514005	0.6000	59.7	62.9	78.7	80.6
11	9	0.7000	0.842195	0.573666	0.4000	60.9	64.0	78.6	80.6
11	9	0.6000	0.760095	0.631482	0.2000	62.5	64.7	79.2	80.6
11	9	0.5000	0.692122			65.0		80.7	
12	11	0.9999	2.255961	0.149346	0.9998	55.6	56.2	68.5	68.7
12	11	0.9995	1.849261	0.169894	0.9990	56.4	57.1	68.1	68.5
12	11	0.9990	1.689910	0.180650	0.9980	56.6	57.5	67.9	68.4
12	11	0.9950	1.351016	0.212129	0.9900	57.2	58.4	67.3	68.1
12	11	0.9900	1.216517	0.229641	0.9800	57.4	58.8	67.0	67.9
12	10	0.9750	1.378577	0.344476	0.9500	57.5	59.6	78.2	79.1
12	10	0.9500	1.211687	0.379810	0.9000	58.3	60.7	77.8	79.0
12	10	0.9000	1.049144	0.426071	0.8000	59.1	61.9	77.3	78.9
12	10	0.8000	0.886772	0.491465	0.6000	60.0	63.2	76.7	78.8
12	10	0.7000	0.788618	0.546209	0.4000	61.0	64.1	76.7	78.9
12	10	0.6000	0.715134	0.598927	0.2000	62.5	64.7	77.4	78.9
12	10	0.5000	0.653892			64.9		78.9	

C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
13	12	0.9999	2.029881	0.147507	0.9998	55.5	56.1	66.7	67.1
13	12	0.9995	1.682235	0.167520	0.9990	56.1	56.9	66.4	66.8
13	12	0.9990	1.544630	0.177970	0.9980	56.3	57.2	66.2	66.7
13	12	0.9950	1.248943	0.208452	0.9900	56.6	57.9*	65.5	66.4
13	11	0.9900	1.468685	0.300255	0.9800	57.3	59.0	76.9	77.6
13	11	0.9750	1.268036	0.334656	0.9500	58.1	60.2	76.4	77.4
13	11	0.9500	1.121884	0.368006	0.9000	58.7	61.1	76.0	77.3
13	11	0.9000	0.978212	0.411445	0.8000	59.3	62.1	75.5	77.2
13	11	0.8000	0.833211	0.472453	0.6000	60.0	63.2	74.9	77.2
13	11	0.7000	0.744749	0.523193	0.4000	60.9	64.0	74.9	77.2
13	11	0.6000	0.678079	0.571790	0.2000	62.3	64.5	75.7	77.3
13	11	0.5000	0.622201			64.7		77.3	
14	13	0.9999	1.851142	0.145849	0.9998	55.2	55.9	65.1	65.5
14	13	0.9995	1.548457	0.165387	0.9990	55.7	56.5	64.7	65.3
14	12	0.9990	1.842593	0.236511	0.9980	55.9	57.0	76.0	76.4
14	12	0.9950	1.495147	0.273156	0.9900	57.2	58.7	75.5	76.2
14	12	0.9900	1.355763	0.293296	0.9800	57.7	59.5	75.3	76.0
14	12	0.9750	1.178786	0.326094	0.9500	58.4	60.5	74.8	75.9
14	12	0.9500	1.048767	0.357757	0.9000	58.8	61.3	74.4	75.8
14	12	0.9000	0.919932	0.398814	0.8000	59.3	62.1	73.8	75.7
14	12	0.8000	0.788749	0.456148	0.6000	59.8	63.1	73.3	75.7
14	12	0.7000	0.708079	0.503560	0.4000	60.6	63.7	73.3	75.7
14	12	0.6000	0.646930	0.548755	0.2000	62.0	64.2	74.0	75.7
14	12	0.5000	0.595428			64.3		75.8	
15	14	0.9999	1.706449	0.144344	0.9998	54.8	55.5*	63.6	64.0
15	13	0.9995	1.833879	0.220180	0.9990	55.9	57.0	74.6	75.0
15	13	0.9990	1.692871	0.232450	0.9980	56.4	57.6	74.5	74.9
15	13	0.9950	1.387217	0.267782	0.9900	57.5	59.1	74.0	74.7
15	13	0.9900	1.263430	0.287130	0.9800	57.9	59.7	73.7	74.6
15	13	0.9750	1.105156	0.318540	0.9500	58.5	60.6	73.3	74.5
15	13	0.9500	0.988009	0.348749	0.9000	58.8	61.3	72.8	74.4
15	13	0.9000	0.871119	0.387765	0.8000	59.1	62.0	72.3	74.3
15	12	0.8000	0.920263	0.540418	0.6000	59.5	62.9	79.7	81.7
15	12	0.7000	0.828123	0.594566	0.4000	60.7	63.7	79.8	81.7
15	12	0.6000	0.758287	0.646176	0.2000	62.2	64.3	80.4	81.7
15	12	0.5000	0.699473			64.5		81.7	
16	14	0.9999	2.005152	0.193769	0.9998	55.4	56.2	73.5	73.8
16	14	0.9995	1.695043	0.216892	0.9990	56.4	57.4	73.2	73.7
16	14	0.9990	1.570296	0.228792	0.9980	56.8	58.0	73.1	73.6
16	14	0.9950	1.297775	0.262963	0.9900	57.7	59.2	72.6	73.4
16	14	0.9900	1.186488	0.281616	0.9800	58.0	59.8	72.3	73.3
16	14	0.9750	1.043321	0.311808	0.9500	58.4	60.5	71.8	73.1
16	14	0.9500	0.936661	0.340749	0.9000	58.6	61.1	71.4	73.0
16	13	0.9000	1.009128	0.460131	0.8000	59.0	62.0	78.8	80.4
16	13	0.8000	0.872865	0.521712	0.6000	59.9	63.2	78.3	80.4
16	13	0.7000	0.788504	0.572361	0.4000	60.9	63.9	78.4	80.4
16	13	0.6000	0.724240	0.620435	0.2000	62.4	64.5	79.0	80.5
16	13	0.5000	0.669886			64.6		80.5	

C. VALUE OF m_{ν} CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
17	15	0.9999	1.855646	0.191376	0.9998	55.7	56.6	72.2	72.6
17	15	0.9995	1.579822	0.213903	0.9990	56.6	57.7	71.9	72.4
17	15	0.9990	1.468123	0.225474	0.9980	56.9	58.2	71.7	72.3
17	15	0.9950	1.222420	0.258609	0.9900	57.6	59.2	71.2	72.1
17	15	0.9900	1.121347	0.276643	0.9800	57.9	59.7	71.0	72.0
17	15	0.9750	0.990611	0.305758	0.9500	58.2	60.4*	70.5	71.8
17	14	0.9500	1.078461	0.404975	0.9000	58.6	61.3	77.9	79.2
17	14	0.9000	0.957399	0.447099	0.8000	59.3	62.3	77.5	79.2
17	14	0.8000	0.832352	0.505315	0.6000	60.0	63.3	77.0	79.2
17	14	0.7000	0.754460	0.552980	0.4000	61.0	64.0	77.1	79.2
17	14	0.6000	0.694857	0.598052	0.2000	62.4	64.5	77.8	79.2
17	14	0.5000	0.644254			64.6		79.3	
18	16	0.9999	1.730698	0.189181	0.9998	55.9	56.9	71.0	71.4
18	16	0.9995	1.482686	0.211170	0.9990	56.6	57.8	70.7	71.2
18	16	0.9990	1.381653	0.222443	0.9980	56.9	58.2	70.5	71.1
18	16	0.9950	1.158040	0.254647	0.9900	57.5	59.1	70.0	70.9
18	15	0.9900	1.281664	0.331117	0.9800	57.7	59.8	77.4	78.3
18	15	0.9750	1.134481	0.363976	0.9500	58.4	60.8	77.1	78.2
18	15	0.9500	1.024211	0.395328	0.9000	58.9	61.6	76.7	78.1
18	15	0.9000	0.912925	0.435503	0.8000	59.4	62.4	76.2	78.0
18	15	0.8000	0.797279	0.490796	0.6000	60.1	63.4	75.7	78.0
18	15	0.7000	0.724847	0.535883	0.4000	60.9	64.0	75.8	78.0
18	15	0.6000	0.669201	0.578375	0.2000	62.3	64.4	76.5	78.1
18	15	0.5000	0.621795			64.5		78.1	
19	17	0.9999	1.624765	0.187158	0.9998	56.0	57.0	69.8	70.2
19	17	0.9995	1.399692	0.208657	0.9990	56.6	57.8	69.5	70.0
19	17	0.9990	1.307514	0.219659	0.9980	56.8	58.1	69.3	69.9
19	16	0.9950	1.317612	0.305226	0.9900	57.6	59.4	76.5	77.2
19	16	0.9900	1.213796	0.324908	0.9800	58.1	60.1	76.3	77.2
19	16	0.9750	1.078882	0.356544	0.9500	58.6	61.0	75.9	77.1
19	16	0.9500	0.977280	0.386644	0.9000	59.1	61.7	75.5	77.0
19	16	0.9000	0.874242	0.425100	0.8000	59.4	62.5	75.0	76.9
19	16	0.8000	0.766582	0.477829	0.6000	60.0	63.3	74.5	76.9
19	16	0.7000	0.698820	0.520667	0.4000	60.8	63.8	74.6	76.9
19	15	0.6000	0.756412	0.655755	0.2000	62.2	64.2	81.2	82.4
19	15	0.5000	0.703873			64.4		82.4	
20	18	0.9999	1.533835	0.185284	0.9998	56.0	56.9	68.7	69.1
20	18	0.9995	1.327954	0.206334	0.9990	56.5	57.7*	68.3	68.9
20	17	0.9990	1.479642	0.264921	0.9980	56.9	58.4	75.8	76.3
20	17	0.9950	1.250475	0.300207	0.9900	57.9	59.7	75.4	76.2
20	17	0.9900	1.155046	0.319249	0.9800	58.3	60.3	75.2	76.1
20	17	0.9750	1.030490	0.349790	0.9500	58.7	61.1	74.7	76.0
20	17	0.9500	0.936249	0.378773	0.9000	59.1	61.7	74.3	75.9
20	17	0.9000	0.840256	0.415701	0.8000	59.4	62.4	73.8	75.8
20	16	0.8000	0.861627	0.542702	0.6000	59.9	63.2	79.4	81.3
20	16	0.7000	0.786774	0.590012	0.4000	60.9	63.9	79.4	81.4
20	16	0.6000	0.729065	0.634461	0.2000	62.4	64.3	80.1	81.4
20	16	0.5000	0.679753			64.5		81.4	

C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
22	19	0.9999	1.633258	0.222895	0.9998	56.2	57.4	74.2	74.6
22	19	0.9995	1.422825	0.246148	0.9990	57.0	58.4	73.9	74.4
22	19	0.9990	1.335863	0.257958	0.9980	57.4	58.9	73.7	74.3
22	19	0.9950	1.140511	0.291350	0.9900	58.1	60.0	73.3	74.2
22	19	0.9900	1.058338	0.309288	0.9800	58.4	60.4	73.0	74.1
22	19	0.9750	0.950269	0.337944	0.9500	58.7	61.1*	72.6	74.0
22	18	0.9500	1.003299	0.423138	0.9000	59.0	61.8	78.1	79.5
22	18	0.9000	0.904556	0.462181	0.8000	59.6	62.6	77.7	79.5
22	18	0.8000	0.800424	0.515348	0.6000	60.2	63.5	77.3	79.4
22	18	0.7000	0.734334	0.558256	0.4000	61.1	64.0	77.4	79.5
22	18	0.6000	0.683061	0.598356	0.2000	62.5	64.4	78.1	79.5
22	18	0.5000	0.639014			64.5		79.5	
24	21	0.9999	1.480046	0.218376	0.9998	56.6	57.8	72.3	72.7
24	21	0.9995	1.299520	0.240663	0.9990	57.2	58.6	72.0	72.6
24	21	0.9990	1.224348	0.251950	0.9980	57.5	59.0	71.8	72.5
24	20	0.9950	1.211151	0.329163	0.9900	58.0	60.1	77.1	77.9
24	20	0.9900	1.127156	0.348266	0.9800	58.5	60.7	76.9	77.9
24	20	0.9750	1.016340	0.378702	0.9500	59.0	61.5	76.6	77.8
24	20	0.9500	0.931525	0.407375	0.9000	59.3	62.1	76.2	77.7
24	20	0.9000	0.844192	0.443635	0.8000	59.7	62.8	75.8	77.7
24	20	0.8000	0.751366	0.492735	0.6000	60.2	63.5	75.4	77.7
24	19	0.7000	0.784638	0.602885	0.4000	61.0	63.9*	80.2	82.0
24	19	0.6000	0.731876	0.644422	0.2000	62.4	64.3	80.8	82.1
24	19	0.5000	0.686446			64.4		82.1	
26	23	0.9999	1.359356	0.214399	0.9998	56.7	57.9	70.5	71.0
26	22	0.9995	1.372122	0.274169	0.9990	57.3	58.9	75.9	76.4
26	22	0.9990	1.295533	0.286250	0.9980	57.6	59.3	75.8	76.4
26	22	0.9950	1.121519	0.320166	0.9900	58.4	60.5	75.4	76.3
26	22	0.9900	1.047435	0.338253	0.9800	58.7	60.9	75.2	76.2
26	22	0.9750	0.949123	0.366976	0.9500	59.1	61.6	74.8	76.1
26	22	0.9500	0.873405	0.393935	0.9000	59.4	62.1	74.4	76.1
26	21	0.9000	0.896438	0.482693	0.8000	59.7	62.8	78.7	80.4
26	21	0.8000	0.801204	0.533849	0.6000	60.4	63.6	78.4	80.4
26	21	0.7000	0.740143	0.574802	0.4000	61.2	64.1	78.5	80.4
26	21	0.6000	0.692415	0.612826	0.2000	62.6	64.4	79.2	80.5
26	21	0.5000	0.651148			64.5		80.5	
28	24	0.9999	1.431924	0.245342	0.9998	56.9	58.3	74.6	75.0
28	24	0.9995	1.270901	0.268334	0.9990	57.6	59.2	74.3	74.9
28	24	0.9990	1.203231	0.279909	0.9980	57.9	59.6	74.2	74.8
28	24	0.9950	1.048515	0.312305	0.9900	58.5	60.6	73.8	74.7
28	24	0.9900	0.982206	0.329524	0.9800	58.8	61.0*	73.5	74.6
28	23	0.9750	1.002869	0.401705	0.9500	59.2	61.8	77.8	79.0
28	23	0.9500	0.925437	0.429916	0.9000	59.5	62.4	77.5	78.9
28	23	0.9000	0.845026	0.465383	0.8000	59.9	63.0	77.1	78.9
28	23	0.8000	0.758737	0.513062	0.6000	60.5	63.7	76.7	78.9
28	23	0.7000	0.703098	0.551063	0.4000	61.3	64.1	76.9	78.9
28	23	0.6000	0.659424	0.586217	0.2000	62.6	64.4	77.6	79.0
28	23	0.5000	0.621528			64.5		79.0	

C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
30	26	0.9999	1.331245	0.240983	0.9998	57.2	58.6	73.1	73.5
30	26	0.9995	1.187769	0.263146	0.9990	57.8	59.3	72.8	73.4
30	26	0.9990	1.127161	0.274279	0.9980	58.0	59.7*	72.7	73.4
30	25	0.9950	1.103420	0.343651	0.9900	58.6	60.8	76.9	77.7
30	25	0.9900	1.035766	0.361724	0.9800	59.0	61.3	76.6	77.6
30	25	0.9750	0.945340	0.390291	0.9500	59.4	62.0	76.3	77.6
30	25	0.9500	0.875155	0.416965	0.9000	59.7	62.5	76.0	77.5
30	25	0.9000	0.801920	0.450391	0.8000	60.0	63.0	75.6	77.5
30	24	0.8000	0.800851	0.548396	0.6000	60.5	63.6	79.2	81.1
30	24	0.7000	0.743887	0.587613	0.4000	61.4	64.1	79.3	81.1
30	24	0.6000	0.699093	0.623834	0.2000	62.7	64.4	79.9	81.2
30	24	0.5000	0.660162			64.5		81.2	
32	28	0.9999	1.247588	0.237062	0.9998	57.3	58.6*	71.7	72.2
32	27	0.9995	1.244357	0.291357	0.9990	57.9	59.6	75.9	76.5
32	27	0.9990	1.182691	0.303082	0.9980	58.2	60.0	75.8	76.5
32	27	0.9950	1.040594	0.335733	0.9900	58.8	61.0	75.4	76.3
32	27	0.9900	0.979187	0.352999	0.9800	59.1	61.4	75.2	76.3
32	27	0.9750	0.896772	0.380224	0.9500	59.4	62.0	74.9	76.2
32	26	0.9500	0.919078	0.448278	0.9000	59.7	62.5	78.4	79.8
32	26	0.9000	0.844328	0.482919	0.8000	60.1	63.1	78.1	79.8
32	26	0.8000	0.763488	0.529213	0.6000	60.7	63.8	77.8	79.8
32	26	0.7000	0.710993	0.565898	0.4000	61.5	64.2	77.9	79.8
32	26	0.6000	0.669571	0.599678	0.2000	62.7	64.4	78.6	79.9
32	26	0.5000	0.633464			64.5		79.9	
34	29	0.9999	1.304359	0.263372	0.9998	57.5	59.0	74.9	75.3
34	29	0.9995	1.172722	0.285958	0.9990	58.1	59.8	74.6	75.2
34	29	0.9990	1.116753	0.297258	0.9980	58.4	60.2	74.5	75.2
34	29	0.9950	0.987200	0.328650	0.9900	58.9	61.0*	74.1	75.1
34	28	0.9900	1.024403	0.381275	0.9800	59.1	61.6	77.7	78.7
34	28	0.9750	0.940470	0.409567	0.9500	59.6	62.2	77.4	78.6
34	28	0.9500	0.874911	0.435872	0.9000	59.9	62.7	77.1	78.6
34	28	0.9000	0.806087	0.468692	0.8000	60.2	63.2	76.7	78.6
34	28	0.8000	0.731322	0.512404	0.6000	60.7	63.8	76.4	78.6
34	27	0.7000	0.746381	0.597874	0.4000	61.5	64.1	79.9	81.7
34	27	0.6000	0.704060	0.632517	0.2000	62.7	64.4	80.5	81.7
34	27	0.5000	0.667123			64.5		81.7	
36	31	0.9999	1.231646	0.259203	0.9998	57.7	59.2	73.6	74.1
36	31	0.9995	1.111570	0.281069	0.9990	58.2	59.9*	73.4	74.0
36	31	0.9990	1.060322	0.291989	0.9980	58.4	60.2*	73.2	74.0
36	30	0.9950	1.031931	0.355450	0.9900	59.1	61.3	76.7	77.5
36	30	0.9900	0.974643	0.372669	0.9800	59.3	61.7	76.5	77.5
36	30	0.9750	0.897353	0.399724	0.9500	59.7	62.3	76.2	77.4
36	30	0.9500	0.836759	0.424820	0.9000	59.9	62.7	75.8	77.4
36	29	0.9000	0.842850	0.497436	0.8000	60.2	63.2	78.8	80.5
36	29	0.8000	0.766625	0.542415	0.6000	60.8	63.8	78.5	80.5
36	29	0.7000	0.716834	0.577885	0.4000	61.6	64.2	78.7	80.5
36	29	0.6000	0.677372	0.610420	0.2000	62.8	64.5	79.3	80.5
36	29	0.5000	0.642844			64.5		80.5	

C. VALUE OF m, CHOSEN TO MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND, ALSO MAXIMIZES EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, UNLESS MARKED *

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
38	33	0.9999	1.169119	0.255393	0.9998	57.7	59.2*	72.4	73.0
38	32	0.9995	1.157737	0.305457	0.9990	58.4	60.2	76.0	76.5
38	32	0.9990	1.105670	0.316842	0.9980	58.6	60.6	75.9	76.5
38	32	0.9950	0.984449	0.348350	0.9900	59.2	61.4	75.5	76.4
38	32	0.9900	0.931487	0.364904	0.9800	59.4	61.8*	75.3	76.4
38	31	0.9750	0.935225	0.425858	0.9500	59.7	62.4	78.3	79.4
38	31	0.9500	0.873587	0.451754	0.9000	60.0	62.9	78.0	79.4
38	31	0.9000	0.808551	0.483943	0.8000	60.4	63.3	77.6	79.4
38	31	0.8000	0.737490	0.526622	0.6000	60.9	63.9	77.4	79.4
38	31	0.7000	0.690910	0.560183	0.4000	61.6	64.2	77.5	79.4
38	31	0.6000	0.653898	0.590896	0.2000	62.8	64.4	78.2	79.4
38	31	0.5000	0.621440			64.5		79.4	
40	34	0.9999	1.215558	0.278301	0.9998	58.0	59.6	75.1	75.6
40	34	0.9995	1.103409	0.300435	0.9990	58.5	60.3	74.9	75.5
40	34	0.9990	1.055310	0.311453	0.9980	58.7	60.6	74.7	75.4
40	33	0.9950	1.023220	0.372365	0.9900	59.2	61.5	77.6	78.5
40	33	0.9900	0.969437	0.389479	0.9800	59.5	62.0	77.4	78.4
40	33	0.9750	0.896554	0.416292	0.9500	59.9	62.5	77.1	78.4
40	33	0.9500	0.839140	0.441081	0.9000	60.2	62.9	76.9	78.4
40	33	0.9000	0.778377	0.471827	0.8000	60.4	63.4	76.5	78.3
40	32	0.8000	0.768717	0.553447	0.6000	60.9	63.9	79.1	81.0
40	32	0.7000	0.721278	0.587802	0.4000	61.7	64.2	79.3	81.0
40	32	0.6000	0.683540	0.619208	0.2000	62.9	64.5	79.9	81.1
40	32	0.5000	0.650412			64.5		81.1	

D. VALUE OF m , CHOSEN TO MAXIMIZE EFFICIENCY E_i OF CENTRAL CONFIDENCE INTERVAL, DOES NOT MAXIMIZE EFFICIENCY E_u OF UPPER CONFIDENCE BOUND--SEE TABLE D4C

n	m	1-P	B_{um}/x_m	$B_{\ell m}/x_m$	1-2P	E_u (%)	E_i (%)	R_u (%)	R_i (%)
13	11	0.9950	1.627988	0.279206	0.9900	56.6	58.1	77.1	77.7
15	13	0.9999	2.187085	0.196396	0.9998	54.8	55.6	74.9	75.2
17	14	0.9750	1.199072	0.372209	0.9500	58.0	60.4	78.3	79.3
20	17	0.9995	1.582632	0.252492	0.9990	56.4	57.8	76.0	76.4
22	18	0.9750	1.099866	0.392402	0.9500	58.5	61.1	78.4	79.5
24	20	0.7000	0.692030	0.532142	0.4000	61.0	63.9	75.5	77.7
28	23	0.9900	1.103136	0.371585	0.9800	58.6	61.0	78.1	79.1
30	25	0.9990	1.260820	0.309568	0.9980	57.8	59.7	77.2	77.8
32	27	0.9999	1.390009	0.267963	0.9998	57.2	58.7	76.2	76.6
34	28	0.9950	1.086829	0.363308	0.9900	58.8	61.1	77.9	78.7
36	30	0.9995	1.220349	0.310958	0.9990	58.1	60.0	77.1	77.7
36	30	0.9990	1.163585	0.322749	0.9980	58.4	60.4	77.0	77.6
38	32	0.9999	1.279531	0.282624	0.9998	57.7	59.4	76.2	76.6
38	31	0.9900	1.013717	0.397906	0.9800	59.3	61.8	78.5	79.5

Appendix E

TABLES OF CONDITIONAL MAXIMUM-LIKELIHOOD ESTIMATORS FROM SINGLY CENSORED SAMPLES

SOURCES OF TABLES

Table E1 *Technometrics* 7(1965), 405–422 (Harter and Moore)
Table E2 *Technometrics* 9(1967), 325–331 (Harter and Moore)
Table E3 *Technometrics* 10(1968), 349–359 (Harter and Moore) [with additional values not previously published (Harter and Moore)]

Table E1

WEIBULL POPULATION — UNBIASING FACTORS AND VARIANCES OF UNBIASED ESTIMATORS

[$\hat{\theta}$ = maximum-likelihood estimator and $\tilde{\theta}$ = unbiased estimator of scale parameter θ; shape parameter $K = 0.5(0.5)4.0(1.0)8.0$]

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=0.5

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	.500000	5.00000000	51	.980769	.07918552
2	.666667	2.33333333	52	.981132	.07764877
3	.750000	1.50000000	53	.981481	.07617051
4	.800000	1.10000000	54	.981818	.07474747
5	.833333	.86666667	55	.982143	.07337662
6	.857143	.71428571	56	.982456	.07205514
7	.875000	.60714286	57	.982758	.07078040
8	.888889	.52777778	58	.983051	.06954997
9	.900000	.46666667	59	.983333	.06836158
10	.909091	.41818182	60	.983606	.06721311
11	.916667	.37878788	61	.983871	.06610259
12	.923077	.34615385	62	.984127	.06502816
13	.928571	.31868132	63	.984375	.06398810
14	.933333	.29523810	64	.984615	.06298077
15	.937500	.27500000	65	.984848	.06200466
16	.941176	.25735294	66	.985075	.06105834
17	.944444	.24183007	67	.985294	.06014047
18	.947368	.22807018	68	.985507	.05924979
19	.950000	.21578947	69	.985714	.05838509
20	.952381	.20476190	70	.985915	.05754527
21	.954545	.19480519	71	.986111	.05672926
22	.956522	.18577075	72	.986302	.05593607
23	.958333	.17753623	73	.986486	.05516475
24	.960000	.17000000	74	.986667	.05441441
25	.961538	.16307692	75	.986842	.05368421
26	.962963	.15669516	76	.987013	.05297334
27	.964286	.15079365	77	.987180	.05228105
28	.965517	.14532020	78	.987342	.05160662
29	.966667	.14022989	79	.987500	.05094937
30	.967742	.13548387	80	.987654	.05030864
31	.968750	.13104839	81	.987805	.04968383
32	.969697	.12689394	82	.987952	.04907435
33	.970588	.12299465	83	.988095	.04847963
34	.971429	.11932773	84	.988235	.04789916
35	.972222	.11587302	85	.988372	.04733242
36	.972973	.11261261	86	.988506	.04677894
37	.973684	.10953058	87	.988636	.04623824
38	.974359	.10661269	88	.988764	.04570991
39	.975000	.10384615	89	.988889	.04519351
40	.975610	.10121951	90	.989011	.04468864
41	.976190	.09872242	91	.989131	.04419494
42	.976744	.09634551	92	.989247	.04371201
43	.977273	.09408034	93	.989362	.04323953
44	.977778	.09191919	94	.989474	.04277716
45	.978261	.08985507	95	.989583	.04232456
46	.978723	.08788159	96	.989691	.04188144
47	.979167	.08599291	97	.989796	.04144751
48	.979592	.08418367	98	.989899	.04102247
49	.980000	.08244898	99	.990000	.04060606
50	.980392	.08078431	100	.990099	.04019802

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=1.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.000000	1.00000000	51	1.000000	.01960784
2	1.000000	.50000000	52	1.000000	.01923077
3	1.000000	.33333333	53	1.000000	.01886792
4	1.000000	.25000000	54	1.000000	.01851852
5	1.000000	.20000000	55	1.000000	.01818182
6	1.000000	.16666667	56	1.000000	.01785714
7	1.000000	.14285714	57	1.000000	.01754386
8	1.000000	.12500000	58	1.000000	.01724138
9	1.000000	.11111111	59	1.000000	.01694915
10	1.000000	.10000000	60	1.000000	.01666667
11	1.000000	.09090909	61	1.000000	.01639344
12	1.000000	.08333333	62	1.000000	.01612903
13	1.000000	.07692308	63	1.000000	.01587302
14	1.000000	.07142857	64	1.000000	.01562500
15	1.000000	.06666667	65	1.000000	.01538462
16	1.000000	.06250000	66	1.000000	.01515152
17	1.000000	.05882353	67	1.000000	.01492537
18	1.000000	.05555556	68	1.000000	.01470588
19	1.000000	.05263158	69	1.000000	.01449275
20	1.000000	.05000000	70	1.000000	.01428571
21	1.000000	.04761905	71	1.000000	.01408451
22	1.000000	.04545455	72	1.000000	.01388889
23	1.000000	.04347826	73	1.000000	.01369863
24	1.000000	.04166667	74	1.000000	.01351351
25	1.000000	.04000000	75	1.000000	.01333333
26	1.000000	.03846154	76	1.000000	.01315789
27	1.000000	.03703704	77	1.000000	.01298701
28	1.000000	.03571429	78	1.000000	.01282051
29	1.000000	.03448276	79	1.000000	.01265823
30	1.000000	.03333333	80	1.000000	.01250000
31	1.000000	.03225806	81	1.000000	.01234568
32	1.000000	.03125000	82	1.000000	.01219512
33	1.000000	.03030303	83	1.000000	.01204819
34	1.000000	.02941176	84	1.000000	.01190476
35	1.000000	.02857143	85	1.000000	.01176471
36	1.000000	.02777778	86	1.000000	.01162791
37	1.000000	.02702703	87	1.000000	.01149425
38	1.000000	.02631579	88	1.000000	.01136364
39	1.000000	.02564103	89	1.000000	.01123596
40	1.000000	.02500000	90	1.000000	.01111111
41	1.000000	.02439024	91	1.000000	.01098901
42	1.000000	.02380952	92	1.000000	.01086957
43	1.000000	.02325581	93	1.000000	.01075269
44	1.000000	.02272727	94	1.000000	.01063830
45	1.000000	.02222222	95	1.000000	.01052632
46	1.000000	.02173913	96	1.000000	.01041667
47	1.000000	.02127660	97	1.000000	.01030928
48	1.000000	.02083333	98	1.000000	.01020408
49	1.000000	.02040816	99	1.000000	.01010101
50	1.000000	.02000000	100	1.000000	.01000000

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=1.5

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.107732	.46099849	51	1.002179	.00872401
2	1.055049	.22723873	52	1.002137	.00855607
3	1.036879	.15053631	53	1.002096	.00839447
4	1.027710	.11250205	54	1.002058	.00823886
5	1.022187	.08979793	55	1.002020	.00808891
6	1.018498	.07471422	56	1.001984	.00794432
7	1.015860	.06396708	57	1.001949	.00780482
8	1.013880	.05592196	58	1.001916	.00767012
9	1.012340	.04967390	59	1.001883	.00754000
10	1.011107	.04468139	60	1.001852	.00741422
11	1.010098	.04060061	61	1.001821	.00729257
12	1.009257	.03720273	62	1.001792	.00717484
13	1.008545	.03432959	63	1.001764	.00706085
14	1.007935	.03186837	64	1.001736	.00695043
15	1.007406	.02973641	65	1.001709	.00684341
16	1.006943	.02787179	66	1.001683	.00673964
17	1.006535	.02622719	67	1.001658	.00663897
18	1.006172	.02476585	68	1.001634	.00654126
19	1.005847	.02345875	69	1.001610	.00644638
20	1.005555	.02228270	70	1.001587	.00635422
21	1.005291	.02121893	71	1.001565	.00626465
22	1.005050	.02025209	72	1.001543	.00617758
23	1.004831	.01936952	73	1.001522	.00609289
24	1.004629	.01856066	74	1.001501	.00601049
25	1.004444	.01781664	75	1.001481	.00593029
26	1.004273	.01712997	76	1.001462	.00585221
27	1.004115	.01649427	77	1.001443	.00577615
28	1.003968	.01590405	78	1.001424	.00570204
29	1.003831	.01535462	79	1.001406	.00562981
30	1.003704	.01484188	80	1.001389	.00555939
31	1.003584	.01436227	81	1.001372	.00549071
32	1.003472	.01391270	82	1.001355	.00542371
33	1.003367	.01349041	83	1.001339	.00535832
34	1.003268	.01309300	84	1.001323	.00529449
35	1.003174	.01271833	85	1.001307	.00523216
36	1.003086	.01236452	86	1.001292	.00517128
37	1.003003	.01202985	87	1.001277	.00511180
38	1.002924	.01171282	88	1.001263	.00505368
39	1.002849	.01141208	89	1.001248	.00499686
40	1.002778	.01112639	90	1.001235	.00494131
41	1.002710	.01085465	91	1.001221	.00488697
42	1.002645	.01059587	92	1.001208	.00483382
43	1.002584	.01034914	93	1.001195	.00478181
44	1.002525	.01011365	94	1.001182	.00473091
45	1.002469	.00988863	95	1.001170	.00468109
46	1.002415	.00967340	96	1.001157	.00463230
47	1.002364	.00946735	97	1.001145	.00458451
48	1.002315	.00926989	98	1.001134	.00453771
49	1.002268	.00908049	99	1.001122	.00449185
50	1.002222	.00889869	100	1.001111	.00444690

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=2.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.128379	.27323954	51	1.002454	.00491392
2	1.063846	.13176848	52	1.002407	.00481919
3	1.042352	.08649774	53	1.002361	.00472805
4	1.031661	.06432432	54	1.002317	.00464030
5	1.025273	.05118452	55	1.002275	.00455574
6	1.021027	.04249704	56	1.002235	.00447421
7	1.018002	.03632842	57	1.002195	.00439554
8	1.015737	.03172251	58	1.002157	.00431959
9	1.013979	.02815254	59	1.002121	.00424623
10	1.012573	.02530447	60	1.002085	.00417531
11	1.011424	.02297952	61	1.002051	.00410672
12	1.010468	.02104572	62	1.002018	.00404035
13	1.009659	.01941205	63	1.001986	.00397610
14	1.008967	.01801368	64	1.001955	.00391385
15	1.008367	.01680320	65	1.001925	.00385352
16	1.007842	.01574513	66	1.001896	.00379503
17	1.007379	.01481240	67	1.001867	.00373828
18	1.006968	.01398398	68	1.001840	.00368320
19	1.006600	.01324330	69	1.001813	.00362973
20	1.006269	.01257713	70	1.001787	.00357778
21	1.005970	.01197477	71	1.001762	.00352730
22	1.005697	.01142746	72	1.001738	.00347823
23	1.005449	.01092799	73	1.001714	.00343050
24	1.005222	.01047035	74	1.001691	.00338407
25	1.005012	.01004949	75	1.001668	.00333887
26	1.004819	.00966116	76	1.001646	.00329487
27	1.004640	.00930172	77	1.001625	.00325201
28	1.004474	.00896807	78	1.001604	.00321025
29	1.004319	.00865752	79	1.001584	.00316955
30	1.004175	.00836776	80	1.001564	.00312987
31	1.004040	.00809677	81	1.001544	.00309117
32	1.003914	.00784278	82	1.001526	.00305341
33	1.003795	.00760423	83	1.001507	.00301657
34	1.003683	.00737977	84	1.001489	.00298061
35	1.003578	.00716818	85	1.001472	.00294549
36	1.003478	.00696839	86	1.001455	.00291119
37	1.003384	.00677943	87	1.001438	.00287768
38	1.003295	.00660045	88	1.001421	.00284493
39	1.003210	.00643067	89	1.001405	.00281292
40	1.003130	.00626941	90	1.001390	.00278163
41	1.003053	.00611604	91	1.001375	.00275102
42	1.002981	.00596999	92	1.001360	.00272107
43	1.002911	.00583076	93	1.001345	.00269178
44	1.002845	.00569787	94	1.001331	.00266310
45	1.002782	.00557090	95	1.001317	.00263503
46	1.002721	.00544947	96	1.001303	.00260755
47	1.002663	.00533322	97	1.001289	.00258063
48	1.002608	.00522183	98	1.001276	.00255427
49	1.002554	.00511499	99	1.001263	.00252843
50	1.002503	.00501244	100	1.001251	.00250312

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=2.5

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.127060	.18310455	51	1.002357	.00314830
2	1.062261	.08652458	52	1.002312	.00308754
3	1.041086	.05634335	53	1.002268	.00302909
4	1.030634	.04172268	54	1.002226	.00297281
5	1.024414	.03311340	55	1.002185	.00291859
6	1.020292	.02744474	56	1.002146	.00286630
7	1.017359	.02343128	57	1.002109	.00281586
8	1.015167	.02044098	58	1.002072	.00276716
9	1.013466	.01812705	59	1.002037	.00272012
10	1.012108	.01628345	60	1.002003	.00267465
11	1.010999	.01478008	61	1.001970	.00263067
12	1.010075	.01353073	62	1.001938	.00258812
13	1.009295	.01247607	63	1.001908	.00254692
14	1.008627	.01157389	64	1.001878	.00250701
15	1.008049	.01079335	65	1.001849	.00246834
16	1.007543	.01011142	66	1.001821	.00243084
17	1.007097	.00951052	67	1.001794	.00239446
18	1.006701	.00897702	68	1.001767	.00235916
19	1.006346	.00850019	69	1.001741	.00232488
20	1.006027	.00807145	70	1.001717	.00229158
21	1.005739	.00768388	71	1.001692	.00225922
22	1.005477	.00733182	72	1.001669	.00222777
23	1.005238	.00701061	73	1.001646	.00219717
24	1.005019	.00671635	74	1.001624	.00216741
25	1.004818	.00644580	75	1.001602	.00213844
26	1.004632	.00619620	76	1.001581	.00211024
27	1.004460	.00596521	77	1.001560	.00208277
28	1.004300	.00575082	78	1.001540	.00205601
29	1.004151	.00555131	79	1.001521	.00202992
30	1.004012	.00536517	80	1.001502	.00200449
31	1.003882	.00519111	81	1.001483	.00197969
32	1.003761	.00502799	82	1.001465	.00195549
33	1.003647	.00487481	83	1.001447	.00193188
34	1.003539	.00473069	84	1.001430	.00190884
35	1.003438	.00459484	85	1.001413	.00188633
36	1.003342	.00446657	86	1.001397	.00186435
37	1.003251	.00434528	87	1.001381	.00184288
38	1.003166	.00423039	88	1.001365	.00182189
39	1.003084	.00412143	89	1.001350	.00180138
40	1.003007	.00401793	90	1.001335	.00178133
41	1.002933	.00391951	91	1.001320	.00176171
42	1.002863	.00382579	92	1.001306	.00174253
43	1.002797	.00373645	93	1.001292	.00172375
44	1.002733	.00365119	94	1.001278	.00170538
45	1.002672	.00356973	95	1.001264	.00168740
46	1.002614	.00349183	96	1.001251	.00166979
47	1.002558	.00341725	97	1.001238	.00165254
48	1.002505	.00334579	98	1.001226	.00163565
49	1.002454	.00327726	99	1.001213	.00161910
50	1.002404	.00321149	100	1.001201	.00160288

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=3.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.119847	.13209336	51	1.002183	.00218813
2	1.058189	.06133753	52	1.002141	.00214587
3	1.038277	.03967758	53	1.002101	.00210521
4	1.028495	.02928080	54	1.002062	.00206607
5	1.022689	.02319038	55	1.002024	.00202835
6	1.018846	.01919354	56	1.001988	.00199199
7	1.016115	.01637029	57	1.001953	.00195691
8	1.014075	.01427035	58	1.001919	.00192304
9	1.012494	.01264752	59	1.001887	.00189032
10	1.011231	.01135588	60	1.001855	.00185870
11	1.010201	.01030348	61	1.001825	.00182812
12	1.009343	.00942952	62	1.001795	.00179853
13	1.008619	.00869217	63	1.001767	.00176988
14	1.007998	.00806173	64	1.001739	.00174213
15	1.007461	.00751654	65	1.001712	.00171524
16	1.006992	.00704040	66	1.001686	.00168916
17	1.006578	.00662097	67	1.001661	.00166387
18	1.006210	.00624870	68	1.001637	.00163932
19	1.005882	.00591606	69	1.001613	.00161549
20	1.005586	.00561704	70	1.001590	.00159234
21	1.005319	.00534678	71	1.001567	.00156984
22	1.005076	.00510133	72	1.001546	.00154797
23	1.004854	.00487743	73	1.001524	.00152670
24	1.004651	.00467235	74	1.001504	.00150601
25	1.004464	.00448383	75	1.001484	.00148587
26	1.004292	.00430992	76	1.001464	.00146626
27	1.004132	.00414900	77	1.001445	.00144716
28	1.003984	.00399966	78	1.001427	.00142856
29	1.003846	.00386070	79	1.001408	.00141042
30	1.003717	.00373107	80	1.001391	.00139274
31	1.003597	.00360986	81	1.001374	.00137550
32	1.003484	.00349628	82	1.001357	.00135868
33	1.003378	.00338962	83	1.001340	.00134227
34	1.003279	.00328928	84	1.001324	.00132625
35	1.003185	.00319471	85	1.001309	.00131060
36	1.003096	.00310543	86	1.001294	.00129533
37	1.003012	.00302100	87	1.001279	.00128040
38	1.002932	.00294104	88	1.001264	.00126581
39	1.002857	.00286520	89	1.001250	.00125155
40	1.002785	.00279318	90	1.001236	.00123761
41	1.002717	.00272469	91	1.001222	.00122398
42	1.002652	.00265947	92	1.001209	.00121064
43	1.002591	.00259731	93	1.001196	.00119760
44	1.002532	.00253798	94	1.001183	.00118483
45	1.002475	.00248131	95	1.001171	.00117232
46	1.002421	.00242711	96	1.001159	.00116008
47	1.002370	.00237523	97	1.001147	.00114810
48	1.002320	.00232551	98	1.001135	.00113636
49	1.002273	.00227784	99	1.001124	.00112485
50	1.002227	.00223208	100	1.001112	.00111358

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=3.5

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.111423	.10014607
2	1.053765	.04581787
3	1.035293	.02947697
4	1.026247	.02169264
5	1.020886	.01715179
6	1.017341	.01417983
7	1.014824	.01208442
8	1.012945	.01052796
9	1.011488	.00932639
10	1.010326	.00837081
11	1.009378	.00759275
12	1.008589	.00694696
13	1.007922	.00640237
14	1.007351	.00593692
15	1.006857	.00553455
16	1.006426	.00518324
17	1.006045	.00487386
18	1.005707	.00459932
19	1.005405	.00435406
20	1.005133	.00413362
21	1.004887	.00393443
22	1.004664	.00375355
23	1.004460	.00358857
24	1.004273	.00343748
25	1.004101	.00329859
26	1.003943	.00317049
27	1.003796	.00305197
28	1.003660	.00294199
29	1.003533	.00283966
30	1.003415	.00274421
31	1.003305	.00265496
32	1.003201	.00257134
33	1.003104	.00249283
34	1.003012	.00241896
35	1.002926	.00234935
36	1.002844	.00228363
37	1.002767	.00222149
38	1.002694	.00216264
39	1.002625	.00210683
40	1.002559	.00205382
41	1.002496	.00200342
42	1.002437	.00195543
43	1.002380	.00190969
44	1.002326	.00186604
45	1.002274	.00182434
46	1.002224	.00178446
47	1.002177	.00174629
48	1.002131	.00170971
49	1.002088	.00167464
50	1.002046	.00164098

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
51	1.002006	.00160864
52	1.001967	.00157756
53	1.001930	.00154765
54	1.001894	.00151885
55	1.001859	.00149111
56	1.001826	.00146436
57	1.001794	.00143856
58	1.001763	.00141365
59	1.001733	.00138958
60	1.001704	.00136633
61	1.001676	.00134383
62	1.001649	.00132207
63	1.001623	.00130100
64	1.001597	.00128059
65	1.001573	.00126081
66	1.001549	.00124164
67	1.001526	.00122304
68	1.001503	.00120498
69	1.001481	.00118745
70	1.001460	.00117043
71	1.001440	.00115389
72	1.001420	.00113780
73	1.001400	.00112216
74	1.001381	.00110695
75	1.001363	.00109214
76	1.001345	.00107772
77	1.001327	.00106368
78	1.001310	.00104999
79	1.001294	.00103666
80	1.001277	.00102366
81	1.001262	.00101098
82	1.001246	.00099862
83	1.001231	.00098655
84	1.001217	.00097477
85	1.001202	.00096327
86	1.001188	.00095203
87	1.001175	.00094106
88	1.001161	.00093033
89	1.001148	.00091985
90	1.001135	.00090960
91	1.001123	.00089958
92	1.001111	.00088977
93	1.001099	.00088018
94	1.001087	.00087079
95	1.001075	.00086160
96	1.001064	.00085260
97	1.001053	.00084379
98	1.001043	.00083515
99	1.001032	.00082670
100	1.001022	.00081841

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=4.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.103263	.07870520	51	1.001843	.00123225
2	1.049606	.03555699	52	1.001807	.00120843
3	1.032516	.02277234	53	1.001773	.00118551
4	1.024163	.01672043	54	1.001740	.00116344
5	1.019220	.01320237	55	1.001709	.00114218
6	1.015954	.01090486	56	1.001678	.00112168
7	1.013635	.00928741	57	1.001648	.00110190
8	1.011905	.00808731	58	1.001620	.00108281
9	1.010564	.00716161	59	1.001592	.00106437
10	1.009495	.00642591	60	1.001566	.00104655
11	1.008622	.00582721	61	1.001540	.00102932
12	1.007896	.00533050	62	1.001515	.00101264
13	1.007283	.00491179	63	1.001491	.00099649
14	1.006758	.00455404	64	1.001468	.00098086
15	1.006304	.00424485	65	1.001445	.00096570
16	1.005907	.00397497	66	1.001423	.00095101
17	1.005557	.00373734	67	1.001402	.00093675
18	1.005246	.00352652	68	1.001381	.00092292
19	1.004968	.00333820	69	1.001361	.00090949
20	1.004718	.00316898	70	1.001342	.00089645
21	1.004492	.00301608	71	1.001323	.00088377
22	1.004286	.00287725	72	1.001304	.00087145
23	1.004099	.00275064	73	1.001287	.00085946
24	1.003927	.00263470	74	1.001269	.00084781
25	1.003769	.00252814	75	1.001252	.00083646
26	1.003624	.00242987	76	1.001236	.00082541
27	1.003489	.00233894	77	1.001220	.00081465
28	1.003364	.00225458	78	1.001204	.00080417
29	1.003247	.00217609	79	1.001189	.00079396
30	1.003138	.00210288	80	1.001174	.00078400
31	1.003037	.00203443	81	1.001159	.00077428
32	1.002942	.00197030	82	1.001145	.00076481
33	1.002852	.00191009	83	1.001131	.00075556
34	1.002768	.00185345	84	1.001118	.00074654
35	1.002688	.00180007	85	1.001105	.00073773
36	1.002614	.00174968	86	1.001092	.00072912
37	1.002543	.00170204	87	1.001079	.00072071
38	1.002476	.00165692	88	1.001067	.00071250
39	1.002412	.00161413	89	1.001055	.00070447
40	1.002351	.00157349	90	1.001043	.00069662
41	1.002294	.00153485	91	1.001032	.00068894
42	1.002239	.00149806	92	1.001020	.00068143
43	1.002187	.00146300	93	1.001009	.00067408
44	1.002137	.00142954	94	1.000999	.00066688
45	1.002089	.00139757	95	1.000988	.00065984
46	1.002044	.00136701	96	1.000978	.00065295
47	1.002000	.00133775	97	1.000968	.00064620
48	1.001958	.00130972	98	1.000958	.00063959
49	1.001918	.00128283	99	1.000948	.00063311
50	1.001880	.00125703	100	1.000939	.00062676

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=5.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.089124	.05246525	51	1.001573	.00078924
2	1.042563	.02323010	52	1.001543	.00077397
3	1.027845	.01477365	53	1.001513	.00075928
4	1.020674	.01080969	54	1.001485	.00074514
5	1.016435	.00851761	55	1.001458	.00073151
6	1.013637	.00702572	56	1.001432	.00071837
7	1.011653	.00597782	57	1.001407	.00070570
8	1.010172	.00520161	58	1.001383	.00069347
9	1.009025	.00460363	59	1.001359	.00068165
10	1.008110	.00412886	60	1.001336	.00067023
11	1.007364	.00374281	61	1.001314	.00065918
12	1.006744	.00342274	62	1.001293	.00064850
13	1.006219	.00315307	63	1.001273	.00063815
14	1.005771	.00292278	64	1.001253	.00062813
15	1.005383	.00272383	65	1.001233	.00061842
16	1.005043	.00255023	66	1.001215	.00060900
17	1.004744	.00239742	67	1.001197	.00059987
18	1.004479	.00226189	68	1.001179	.00059101
19	1.004241	.00214086	69	1.001162	.00058240
20	1.004028	.00203212	70	1.001145	.00057404
21	1.003835	.00193389	71	1.001129	.00056592
22	1.003659	.00184472	72	1.001113	.00055803
23	1.003499	.00176341	73	1.001098	.00055035
24	1.003353	.00168896	74	1.001083	.00054288
25	1.003218	.00162054	75	1.001069	.00053561
26	1.003093	.00155745	76	1.001055	.00052853
27	1.002978	.00149909	77	1.001041	.00052164
28	1.002871	.00144494	78	1.001027	.00051493
29	1.002772	.00139457	79	1.001014	.00050838
30	1.002679	.00134759	80	1.001002	.00050200
31	1.002592	.00130367	81	1.000989	.00049578
32	1.002511	.00126253	82	1.000977	.00048971
33	1.002434	.00122390	83	1.000965	.00048379
34	1.002363	.00118757	84	1.000954	.00047801
35	1.002295	.00115333	85	1.000943	.00047236
36	1.002231	.00112101	86	1.000932	.00046685
37	1.002170	.00109045	87	1.000921	.00046146
38	1.002113	.00106151	88	1.000911	.00045620
39	1.002059	.00103407	89	1.000900	.00045106
40	1.002007	.00100802	90	1.000890	.00044603
41	1.001958	.00098324	91	1.000880	.00044111
42	1.001911	.00095965	92	1.000871	.00043630
43	1.001867	.00093717	93	1.000862	.00043159
44	1.001824	.00091571	94	1.000852	.00042698
45	1.001783	.00089522	95	1.000843	.00042247
46	1.001744	.00087562	96	1.000835	.00041806
47	1.001707	.00085687	97	1.000826	.00041373
48	1.001672	.00083890	98	1.000817	.00040950
49	1.001637	.00082167	99	1.000809	.00040535
50	1.001604	.00080513	100	1.000801	.00040128

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=6.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.077912	.03754820	51	1.001366	.00054838
2	1.037070	.01637374	52	1.001339	.00053776
3	1.024223	.01035970	53	1.001314	.00052755
4	1.017974	.00756092	54	1.001289	.00051772
5	1.014284	.00594882	55	1.001266	.00050825
6	1.011850	.00490205	56	1.001243	.00049911
7	1.010124	.00416801	57	1.001221	.00049030
8	1.008837	.00362492	58	1.001200	.00048180
9	1.007840	.00320692	59	1.001180	.00047359
10	1.007045	.00287528	60	1.001160	.00046565
11	1.006396	.00260576	61	1.001141	.00045797
12	1.005857	.00238241	62	1.001123	.00045054
13	1.005401	.00219431	63	1.001105	.00044335
14	1.005012	.00203373	64	1.001088	.00043639
15	1.004674	.00189504	65	1.001071	.00042964
16	1.004380	.00177405	66	1.001055	.00042309
17	1.004120	.00166758	67	1.001039	.00041675
18	1.003889	.00157317	68	1.001023	.00041059
19	1.003683	.00148887	69	1.001009	.00040461
20	1.003497	.00141314	70	1.000994	.00039880
21	1.003330	.00134474	71	1.000980	.00039315
22	1.003177	.00128266	72	1.000966	.00038767
23	1.003038	.00122605	73	1.000953	.00038233
24	1.002911	.00117423	74	1.000940	.00037714
25	1.002794	.00112661	75	1.000928	.00037209
26	1.002686	.00108271	76	1.000915	.00036717
27	1.002586	.00104209	77	1.000904	.00036238
28	1.002493	.00100442	78	1.000892	.00035771
29	1.002407	.00096937	79	1.000881	.00035317
30	1.002326	.00093668	80	1.000870	.00034873
31	1.002251	.00090613	81	1.000859	.00034441
32	1.002180	.00087751	82	1.000848	.00034019
33	1.002114	.00085064	83	1.000838	.00033607
34	1.002051	.00082537	84	1.000828	.00033206
35	1.001992	.00080155	85	1.000818	.00032813
36	1.001937	.00077907	86	1.000809	.00032430
37	1.001884	.00075782	87	1.000800	.00032056
38	1.001834	.00073769	88	1.000790	.00031690
39	1.001787	.00071861	89	1.000782	.00031333
40	1.001742	.00070049	90	1.000773	.00030983
41	1.001700	.00068326	91	1.000764	.00030642
42	1.001659	.00066686	92	1.000756	.00030307
43	1.001620	.00065123	93	1.000748	.00029980
44	1.001584	.00063631	94	1.000740	.00029660
45	1.001548	.00062206	95	1.000732	.00029347
46	1.001514	.00060843	96	1.000724	.00029040
47	1.001482	.00059539	97	1.000717	.00028740
48	1.001451	.00058290	98	1.000710	.00028445
49	1.001421	.00057092	99	1.000702	.00028157
50	1.001393	.00055942	100	1.000695	.00027874

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=7.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.069018	.02823145	51	1.001204	.00040305
2	1.032756	.01216533	52	1.001181	.00039525
3	1.021387	.00766682	53	1.001158	.00038774
4	1.015863	.00558486	54	1.001137	.00038051
5	1.012604	.00438916	55	1.001116	.00037354
6	1.010454	.00361417	56	1.001096	.00036683
7	1.008931	.00307138	57	1.001077	.00036035
8	1.007794	.00267015	58	1.001058	.00035410
9	1.006915	.00236154	59	1.001040	.00034806
10	1.006213	.00211683	60	1.001023	.00034222
11	1.005641	.00191803	61	1.001006	.00033658
12	1.005165	.00175335	62	1.000990	.00033112
13	1.004763	.00161470	63	1.000974	.00032583
14	1.004420	.00149636	64	1.000959	.00032071
15	1.004122	.00139418	65	1.000944	.00031575
16	1.003862	.00130506	66	1.000930	.00031094
17	1.003633	.00122664	67	1.000916	.00030627
18	1.003430	.00115711	68	1.000902	.00030174
19	1.003248	.00109504	69	1.000889	.00029735
20	1.003084	.00103929	70	1.000877	.00029308
21	1.002936	.00098893	71	1.000864	.00028893
22	1.002802	.00094324	72	1.000852	.00028490
23	1.002679	.00090157	73	1.000840	.00028097
24	1.002567	.00086343	74	1.000829	.00027716
25	1.002464	.00082839	75	1.000818	.00027344
26	1.002368	.00079608	76	1.000807	.00026983
27	1.002280	.00076620	77	1.000797	.00026631
28	1.002198	.00073848	78	1.000786	.00026288
29	1.002122	.00071269	79	1.000776	.00025953
30	1.002051	.00068864	80	1.000767	.00025628
31	1.001984	.00066617	81	1.000757	.00025310
32	1.001922	.00064511	82	1.000748	.00025000
33	1.001864	.00062534	83	1.000739	.00024697
34	1.001809	.00060675	84	1.000730	.00024402
35	1.001757	.00058924	85	1.000722	.00024114
36	1.001708	.00057270	86	1.000713	.00023832
37	1.001661	.00055707	87	1.000705	.00023557
38	1.001618	.00054227	88	1.000697	.00023288
39	1.001576	.00052823	89	1.000689	.00023025
40	1.001536	.00051491	90	1.000681	.00022768
41	1.001499	.00050224	91	1.000674	.00022517
42	1.001463	.00049017	92	1.000667	.00022272
43	1.001429	.00047868	93	1.000659	.00022031
44	1.001396	.00046771	94	1.000652	.00021796
45	1.001365	.00045723	95	1.000645	.00021565
46	1.001335	.00044721	96	1.000639	.00021340
47	1.001307	.00043762	97	1.000632	.00021119
48	1.001279	.00042843	98	1.000626	.00020903
49	1.001253	.00041962	99	1.000619	.00020691
50	1.001228	.00041117	100	1.000613	.00020483

UNBIASING FACTORS FOR MAXIMUM LIKELIHOOD ESTIMATORS AND VARIANCES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER θ OF WEIBULL POPULATION

SHAPE PARAMETER K=8.0

m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$	m	$\tilde{\theta}/\hat{\theta}$	Var $\tilde{\theta}/\theta^2$
1	1.061861	.02201333	51	1.001076	.00030868
2	1.029305	.00939588	52	1.001055	.00030270
3	1.019123	.00590316	53	1.001035	.00029695
4	1.014180	.00429371	54	1.001016	.00029141
5	1.011265	.00337150	55	1.000997	.00028607
6	1.009343	.00277461	56	1.000979	.00028093
7	1.007980	.00235696	57	1.000962	.00027597
8	1.006965	.00204845	58	1.000945	.00027118
9	1.006178	.00181128	59	1.000929	.00026655
10	1.005551	.00162328	60	1.000914	.00026208
11	1.005040	.00147062	61	1.000899	.00025776
12	1.004615	.00134419	62	1.000884	.00025358
13	1.004256	.00123776	63	1.000870	.00024953
14	1.003949	.00114695	64	1.000857	.00024560
15	1.003683	.00106854	65	1.000843	.00024180
16	1.003450	.00100017	66	1.000831	.00023812
17	1.003246	.00094002	67	1.000818	.00023454
18	1.003064	.00088669	68	1.000806	.00023108
19	1.002901	.00083908	69	1.000794	.00022771
20	1.002755	.00079633	70	1.000783	.00022444
21	1.002623	.00075772	71	1.000772	.00022126
22	1.002503	.00072268	72	1.000761	.00021817
23	1.002393	.00069074	73	1.000751	.00021517
24	1.002293	.00066150	74	1.000741	.00021224
25	1.002201	.00063463	75	1.000731	.00020940
26	1.002116	.00060987	76	1.000721	.00020663
27	1.002037	.00058696	77	1.000712	.00020393
28	1.001964	.00056571	78	1.000702	.00020131
29	1.001896	.00054595	79	1.000694	.00019875
30	1.001832	.00052752	80	1.000685	.00019625
31	1.001773	.00051029	81	1.000676	.00019381
32	1.001717	.00049415	82	1.000668	.00019144
33	1.001665	.00047901	83	1.000660	.00018912
34	1.001616	.00046476	84	1.000652	.00018686
35	1.001569	.00045133	85	1.000645	.00018465
36	1.001526	.00043866	86	1.000637	.00018250
37	1.001484	.00042669	87	1.000630	.00018039
38	1.001445	.00041534	88	1.000623	.00017833
39	1.001408	.00040459	89	1.000616	.00017632
40	1.001372	.00039438	90	1.000609	.00017435
41	1.001339	.00038467	91	1.000602	.00017243
42	1.001307	.00037543	92	1.000595	.00017054
43	1.001276	.00036662	93	1.000589	.00016870
44	1.001247	.00035822	94	1.000583	.00016690
45	1.001219	.00035019	95	1.000577	.00016514
46	1.001193	.00034251	96	1.000571	.00016341
47	1.001167	.00033516	97	1.000565	.00016172
48	1.001143	.00032813	98	1.000559	.00016006
49	1.001120	.00032138	99	1.000553	.00015844
50	1.001097	.00031490	100	1.000548	.00015685

Table E2

TYPE I EXTREME-VALUE POPULATION — BIASES, AND VARIANCES OF UNBIASED ESTIMATORS

[b = scale parameter (known); u = location parameter (unknown); $\hat{u}_{mn}$ = maximum-likelihood estimator of u from first m order statistics of a sample of size $n \geq m$]

VALUES OF $E[(\hat{u}_{mn}|b)-u]/b$ AND $V(\hat{u}_{mn}|b)/b^2$

m	E/b	V/b	m	E/b	V/b
1	-0.577216	1.644934	51	-0.009836	0.019801
2	-0.270363	0.644934	52	-0.009646	0.019417
3	-0.175828	0.394934	53	-0.009464	0.019047
4	-0.130177	0.283823	54	-0.009288	0.018691
5	-0.103320	0.221323	55	-0.009118	0.018348
6	-0.085642	0.181323	56	-0.008955	0.018018
7	-0.073126	0.153545	57	-0.008798	0.017699
8	-0.063800	0.133137	58	-0.008645	0.017391
9	-0.056583	0.117512	59	-0.008499	0.017094
10	-0.050833	0.105166	60	-0.008356	0.016806
11	-0.046143	0.095166	61	-0.008219	0.016529
12	-0.042245	0.086902	62	-0.008086	0.016260
13	-0.038954	0.079957	63	-0.007958	0.016000
14	-0.036139	0.074040	64	-0.007833	0.015748
15	-0.033704	0.068938	65	-0.007712	0.015504
16	-0.031575	0.064494	66	-0.007595	0.015267
17	-0.029700	0.060588	67	-0.007481	0.015037
18	-0.028035	0.057127	68	-0.007371	0.014815
19	-0.026547	0.054041	69	-0.007264	0.014598
20	-0.025208	0.051271	70	-0.007160	0.014388
21	-0.023998	0.048771	71	-0.007059	0.014184
22	-0.022899	0.046503	72	-0.006961	0.013986
23	-0.021897	0.044437	73	-0.006865	0.013793
24	-0.020978	0.042547	74	-0.006772	0.013605
25	-0.020133	0.040811	75	-0.006681	0.013423
26	-0.019354	0.039211	76	-0.006593	0.013245
27	-0.018633	0.037731	77	-0.006508	0.013072
28	-0.017963	0.036360	78	-0.006424	0.012903
29	-0.017340	0.035084	79	-0.006342	0.012739
30	-0.016759	0.033895	80	-0.006263	0.012578
31	-0.016216	0.032784	81	-0.006186	0.012422
32	-0.015706	0.031743	82	-0.006110	0.012270
33	-0.015228	0.030767	83	-0.006036	0.012121
34	-0.014778	0.029849	84	-0.005964	0.011976
35	-0.014354	0.028983	85	-0.005894	0.011834
36	-0.013953	0.028167	86	-0.005825	0.011696
37	-0.013574	0.027396	87	-0.005758	0.011561
38	-0.013216	0.026665	88	-0.005693	0.011428
39	-0.012875	0.025973	89	-0.005628	0.011299
40	-0.012552	0.025315	90	-0.005566	0.011173
41	-0.012245	0.024690	91	-0.005505	0.011050
42	-0.011952	0.024095	92	-0.005445	0.010929
43	-0.011673	0.023528	93	-0.005386	0.010811
44	-0.011407	0.022987	94	-0.005329	0.010695
45	-0.011152	0.022471	95	-0.005272	0.010582
46	-0.010909	0.021977	96	-0.005217	0.010471
47	-0.010676	0.021505	97	-0.005163	0.010363
48	-0.010453	0.021052	98	-0.005111	0.010256
49	-0.010239	0.020618	99	-0.005059	0.010152
50	-0.010033	0.020201	100	-0.005008	0.010050

Table E3

TYPE II EXTREME-VALUE POPULATION — UNBIASING FACTOR, VARIANCE, AND EFFICIENCY

[Scale parameter $v = v_n$ for distribution of largest values; scale parameter $v = v_1$ for distribution of smallest values; $\hat{v}$ = maximum-likelihood estimator and $\tilde{v}$ = unbiased estimator of v; sample size $n \geq m$; shape parameter $K = 0.5(0.5)4.0(1.0)8.0$]

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=0.5

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\hat{v})$
1				51	0.941945	0.08599290	91.21
2				52	0.943047	0.08418367	91.38
3	0.222222			53	0.944108	0.08244897	91.54
4	0.375000			54	0.945130	0.08078431	91.69
5	0.480000	5.00000000	16.00	55	0.946116	0.07918552	91.84
6	0.555556	2.33333333	28.57	56	0.947066	0.07764876	91.99
7	0.612245	1.50000000	38.10	57	0.947984	0.07617050	92.13
8	0.656250	1.10000000	45.45	58	0.948870	0.07474747	92.26
9	0.691358	0.86666667	51.28	59	0.949727	0.07337662	92.40
10	0.720000	0.71428571	56.00	60	0.950556	0.07205513	92.52
11	0.743802	0.60714286	59.89	61	0.951357	0.07078040	92.64
12	0.763889	0.52777778	63.16	62	0.952133	0.06954997	92.76
13	0.781065	0.46666667	65.93	63	0.952885	0.06836158	92.88
14	0.795918	0.41818182	68.32	64	0.953613	0.06721311	92.99
15	0.808889	0.37878788	70.40	65	0.954320	0.06610259	93.10
16	0.820313	0.34615384	72.22	66	0.955005	0.06502816	93.20
17	0.830450	0.31868131	73.83	67	0.955669	0.06398809	93.30
18	0.839506	0.29523809	75.27	68	0.956315	0.06298076	93.40
19	0.847645	0.27500000	76.56	69	0.956942	0.06200466	93.49
20	0.855000	0.25735294	77.71	70	0.957551	0.06105834	93.59
21	0.861678	0.24183006	78.76	71	0.958143	0.06014047	93.68
22	0.867769	0.22807017	79.72	72	0.958719	0.05924978	93.76
23	0.873346	0.21578947	80.59	73	0.959279	0.05838509	93.85
24	0.878472	0.20476190	81.40	74	0.959825	0.05754527	93.93
25	0.883200	0.19480519	82.13	75	0.960356	0.05672926	94.01
26	0.887574	0.18577075	82.82	76	0.960873	0.05593607	94.09
27	0.891632	0.17753623	83.45	77	0.961376	0.05516475	94.17
28	0.895408	0.17000000	84.03	78	0.961867	0.05441441	94.24
29	0.898930	0.16307692	84.58	79	0.962346	0.05368420	94.32
30	0.902222	0.15669515	85.09	80	0.962812	0.05297334	94.39
31	0.905307	0.15079365	85.57	81	0.963268	0.05228105	94.46
32	0.908203	0.14532019	86.02	82	0.963712	0.05160662	94.52
33	0.910927	0.14022988	86.44	83	0.964146	0.05094936	94.59
34	0.913495	0.13548387	86.83	84	0.964569	0.05030864	94.65
35	0.915918	0.13104838	87.21	85	0.964983	0.04968382	94.72
36	0.918210	0.12689394	87.56	86	0.965387	0.04907434	94.78
37	0.920380	0.12299465	87.90	87	0.965781	0.04847963	94.84
38	0.922438	0.11932772	88.21	88	0.966167	0.04789916	94.90
39	0.924392	0.11587301	88.51	89	0.966545	0.04733242	94.95
40	0.926250	0.11261261	88.80	90	0.966914	0.04677893	95.01
41	0.928019	0.10953058	89.07	91	0.967274	0.04623824	95.06
42	0.929705	0.10661268	89.33	92	0.967628	0.04570991	95.12
43	0.931314	0.10384615	89.58	93	0.967973	0.04519350	95.17
44	0.932851	0.10121951	89.81	94	0.968311	0.04468864	95.22
45	0.934321	0.09872241	90.04	95	0.968643	0.04419493	95.27
46	0.935728	0.09634551	90.25	96	0.968967	0.04371201	95.32
47	0.937076	0.09408034	90.46	97	0.969285	0.04323953	95.37
48	0.938368	0.09191919	90.66	98	0.969596	0.04277715	95.42
49	0.939608	0.08985507	90.85	99	0.969901	0.04232456	95.46
50	0.940800	0.08788159	91.03	100	0.970200	0.04188144	95.51

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER **v** OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=1.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1				51	0.980392	0.02040816	96.08
2	0.500000			52	0.980769	0.02000000	96.15
3	0.666667	1.00000000	33.33	53	0.981132	0.01960784	96.23
4	0.750000	0.50000000	50.00	54	0.981481	0.01923077	96.30
5	0.800000	0.33333333	60.00	55	0.981818	0.01886792	96.36
6	0.833333	0.25000000	66.67	56	0.982143	0.01851851	96.43
7	0.857143	0.20000000	71.43	57	0.982456	0.01818182	96.49
8	0.875000	0.16666667	75.00	58	0.982759	0.01785714	96.55
9	0.888889	0.14285714	77.78	59	0.983051	0.01754385	96.61
10	0.900000	0.12500000	80.00	60	0.983333	0.01724137	96.67
11	0.909091	0.11111111	81.82	61	0.983607	0.01694915	96.72
12	0.916667	0.10000000	83.33	62	0.983871	0.01666667	96.77
13	0.923077	0.09090909	84.62	63	0.984127	0.01639344	96.83
14	0.928571	0.08333333	85.71	64	0.984375	0.01612903	96.88
15	0.933333	0.07692307	86.67	65	0.984615	0.01587301	96.92
16	0.937500	0.07142857	87.50	66	0.984848	0.01562500	96.97
17	0.941176	0.06666667	88.24	67	0.985075	0.01538461	97.01
18	0.944444	0.06250000	88.89	68	0.985294	0.01515151	97.06
19	0.947368	0.05882353	89.47	69	0.985507	0.01492537	97.10
20	0.950000	0.05555556	90.00	70	0.985714	0.01470588	97.14
21	0.952381	0.05263157	90.48	71	0.985915	0.01449275	97.18
22	0.954545	0.05000000	90.91	72	0.986111	0.01428571	97.22
23	0.956522	0.04761904	91.30	73	0.986301	0.01408450	97.26
24	0.958333	0.04545455	91.67	74	0.986486	0.01388889	97.30
25	0.960000	0.04347826	92.00	75	0.986667	0.01369863	97.33
26	0.961538	0.04166667	92.31	76	0.986842	0.01351351	97.37
27	0.962963	0.04000000	92.59	77	0.987013	0.01333333	97.40
28	0.964286	0.03846154	92.86	78	0.987179	0.01315789	97.44
29	0.965517	0.03703703	93.10	79	0.987342	0.01298701	97.47
30	0.966667	0.03571428	93.33	80	0.987500	0.01282051	97.50
31	0.967742	0.03448275	93.55	81	0.987654	0.01265822	97.53
32	0.968750	0.03333333	93.75	82	0.987805	0.01250000	97.56
33	0.969697	0.03225806	93.94	83	0.987952	0.01234568	97.59
34	0.970588	0.03125000	94.12	84	0.988095	0.01219512	97.62
35	0.971429	0.03030303	94.29	85	0.988235	0.01204819	97.65
36	0.972222	0.02941176	94.44	86	0.988372	0.01190476	97.67
37	0.972973	0.02857143	94.59	87	0.988506	0.01176471	97.70
38	0.973684	0.02777778	94.74	88	0.988636	0.01162791	97.73
39	0.974359	0.02702703	94.87	89	0.988764	0.01149425	97.75
40	0.975000	0.02631579	95.00	90	0.988889	0.01136364	97.78
41	0.975610	0.02564102	95.12	91	0.989011	0.01123595	97.80
42	0.976190	0.02500000	95.24	92	0.989130	0.01111111	97.83
43	0.976744	0.02439024	95.35	93	0.989247	0.01098901	97.85
44	0.977273	0.02380952	95.45	94	0.989362	0.01086956	97.87
45	0.977778	0.02325581	95.56	95	0.989474	0.01075269	97.89
46	0.978261	0.02272727	95.65	96	0.989583	0.01063830	97.92
47	0.978723	0.02222222	95.74	97	0.989691	0.01052631	97.94
48	0.979167	0.02173913	95.83	98	0.989796	0.01041667	97.96
49	0.979592	0.02127659	95.92	99	0.989899	0.01030927	97.98
50	0.980000	0.02083333	96.00	100	0.990000	0.01020408	98.00

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER **v** OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=1.5

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.373282			51	0.989083	0.00895847	97.28
2	0.705459	0.69814004	31.83	52	0.989293	0.00878147	97.33
3	0.807549	0.27360503	54.15	53	0.989496	0.00861132	97.38
4	0.857079	0.16963727	65.50	54	0.989691	0.00844765	97.43
5	0.886330	0.12285178	72.35	55	0.989879	0.00829007	97.48
6	0.905641	0.09627540	76.94	56	0.990060	0.00813828	97.52
7	0.919342	0.07914610	80.22	57	0.990234	0.00799194	97.56
8	0.929569	0.06718881	82.69	58	0.990403	0.00785077	97.61
9	0.937494	0.05836906	84.60	59	0.990566	0.00771450	97.65
10	0.943816	0.05159550	86.14	60	0.990724	0.00758288	97.69
11	0.948976	0.04623022	87.40	61	0.990876	0.00745568	97.72
12	0.953268	0.04187546	88.45	62	0.991023	0.00733267	97.76
13	0.956895	0.03827035	89.33	63	0.991166	0.00721365	97.80
14	0.959998	0.03523669	90.09	64	0.991304	0.00709844	97.83
15	0.962685	0.03264860	90.75	65	0.991438	0.00698685	97.86
16	0.965034	0.03041464	91.33	66	0.991568	0.00687872	97.90
17	0.967104	0.02846679	91.84	67	0.991694	0.00677387	97.93
18	0.968943	0.02675339	92.29	68	0.991817	0.00667218	97.96
19	0.970588	0.02523452	92.70	69	0.991935	0.00657350	97.99
20	0.972066	0.02387884	93.06	70	0.992051	0.00647769	98.02
21	0.973404	0.02266139	93.39	71	0.992163	0.00638464	98.04
22	0.974619	0.02156205	93.69	72	0.992272	0.00629422	98.07
23	0.975728	0.02056443	93.97	73	0.992378	0.00620633	98.10
24	0.976744	0.01965503	94.22	74	0.992481	0.00612085	98.12
25	0.977678	0.01882266	94.45	75	0.992582	0.00603770	98.15
26	0.978541	0.01805793	94.66	76	0.992679	0.00595678	98.17
27	0.979339	0.01735290	94.86	77	0.992775	0.00587800	98.20
28	0.980079	0.01670086	95.04	78	0.992867	0.00580128	98.22
29	0.980769	0.01609604	95.21	79	0.992958	0.00572653	98.24
30	0.981412	0.01553349	95.37	80	0.993046	0.00565368	98.26
31	0.982014	0.01500894	95.52	81	0.993132	0.00558267	98.29
32	0.982578	0.01451866	95.66	82	0.993216	0.00551341	98.31
33	0.983108	0.01405939	95.79	83	0.993298	0.00544586	98.33
34	0.983606	0.01362829	95.92	84	0.993377	0.00537994	98.35
35	0.984076	0.01322284	96.03	85	0.993455	0.00531559	98.37
36	0.984520	0.01284081	96.14	86	0.993532	0.00525277	98.39
37	0.984940	0.01248024	96.25	87	0.993606	0.00519142	98.40
38	0.985337	0.01213937	96.35	88	0.993679	0.00513148	98.42
39	0.985714	0.01181662	96.44	89	0.993750	0.00507290	98.44
40	0.986072	0.01151059	96.53	90	0.993820	0.00501566	98.46
41	0.986413	0.01122001	96.61	91	0.993888	0.00495968	98.47
42	0.986737	0.01094374	96.69	92	0.993954	0.00490495	98.49
43	0.987047	0.01068075	96.77	93	0.994019	0.00485141	98.51
44	0.987342	0.01043010	96.84	94	0.994083	0.00479902	98.52
45	0.987624	0.01019094	96.91	95	0.994145	0.00474776	98.54
46	0.987893	0.00996251	96.98	96	0.994206	0.00469758	98.55
47	0.988152	0.00974409	97.05	97	0.994266	0.00464845	98.57
48	0.988399	0.00953504	97.11	98	0.994325	0.00460033	98.58
49	0.988636	0.00933478	97.17	99	0.994382	0.00455320	98.60
50	0.988864	0.00914276	97.22	100	0.994438	0.00450703	98.61

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER **v** OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=2.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.564190			51	0.992626	0.00501243	97.80
2	0.797885	0.27323954	45.75	52	0.992768	0.00491391	97.84
3	0.868627	0.13176848	63.24	53	0.992905	0.00481919	97.88
4	0.902703	0.08649774	72.26	54	0.993037	0.00472805	97.92
5	0.922746	0.06432432	77.73	55	0.993164	0.00464030	97.96
6	0.935942	0.05118451	81.40	56	0.993286	0.00455573	97.99
7	0.945288	0.04249704	84.04	57	0.993404	0.00447420	98.03
8	0.952254	0.03632841	86.02	58	0.993518	0.00439554	98.06
9	0.957646	0.03172251	87.56	59	0.993628	0.00431959	98.09
10	0.961945	0.02815253	88.80	60	0.993735	0.00424622	98.13
11	0.965451	0.02530447	89.82	61	0.993838	0.00417531	98.16
12	0.968365	0.02297951	90.66	62	0.993937	0.00410672	98.19
13	0.970826	0.02104571	91.38	63	0.994034	0.00404035	98.22
14	0.972932	0.01941204	91.99	64	0.994127	0.00397609	98.24
15	0.974754	0.01801367	92.52	65	0.994218	0.00391384	98.27
16	0.976347	0.01680319	92.99	66	0.994306	0.00385351	98.30
17	0.977750	0.01574513	93.40	67	0.994391	0.00379502	98.32
18	0.978996	0.01481239	93.77	68	0.994473	0.00373828	98.35
19	0.980110	0.01398397	94.09	69	0.994554	0.00368320	98.37
20	0.981112	0.01324330	94.39	70	0.994632	0.00362972	98.39
21	0.982018	0.01257713	94.65	71	0.994707	0.00357778	98.42
22	0.982841	0.01197477	94.90	72	0.994781	0.00352730	98.44
23	0.983592	0.01142745	95.12	73	0.994853	0.00347823	98.46
24	0.984279	0.01092798	95.32	74	0.994922	0.00343050	98.48
25	0.984912	0.01047035	95.51	75	0.994990	0.00338406	98.50
26	0.985496	0.01004949	95.68	76	0.995056	0.00333887	98.52
27	0.986036	0.00966116	95.84	77	0.995121	0.00329486	98.54
28	0.986537	0.00930172	95.99	78	0.995183	0.00325200	98.56
29	0.987004	0.00896807	96.13	79	0.995244	0.00321025	98.58
30	0.987439	0.00865752	96.26	80	0.995304	0.00316954	98.59
31	0.987846	0.00836776	96.38	81	0.995362	0.00312986	98.61
32	0.988228	0.00809677	96.49	82	0.995419	0.00309116	98.63
33	0.988586	0.00784277	96.60	83	0.995474	0.00305341	98.65
34	0.988923	0.00760423	96.70	84	0.995528	0.00301657	98.66
35	0.989241	0.00737977	96.79	85	0.995581	0.00298060	98.68
36	0.989541	0.00716818	96.88	86	0.995632	0.00294548	98.69
37	0.989825	0.00696839	96.96	87	0.995682	0.00291119	98.71
38	0.990094	0.00677942	97.04	88	0.995732	0.00287768	98.72
39	0.990349	0.00660044	97.12	89	0.995780	0.00284493	98.74
40	0.990591	0.00643066	97.19	90	0.995827	0.00281292	98.75
41	0.990821	0.00626940	97.26	91	0.995873	0.00278162	98.76
42	0.991040	0.00611603	97.32	92	0.995917	0.00275102	98.78
43	0.991249	0.00596999	97.39	93	0.995961	0.00272107	98.79
44	0.991449	0.00583075	97.45	94	0.996004	0.00269177	98.80
45	0.991640	0.00569786	97.50	95	0.996047	0.00266310	98.82
46	0.991822	0.00557090	97.56	96	0.996088	0.00263503	98.83
47	0.991996	0.00544947	97.61	97	0.996128	0.00260755	98.84
48	0.992164	0.00533322	97.66	98	0.996168	0.00258063	98.85
49	0.992324	0.00522182	97.71	99	0.996207	0.00255426	98.86
50	0.992478	0.00511499	97.75	100	0.996245	0.00252843	98.88

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=2.5

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.671505	1.07009831	14.95	51	0.994493	0.00319864	98.08
2	0.848176	0.15005462	53.31	52	0.994599	0.00313595	98.12
3	0.901487	0.07817621	68.22	53	0.994701	0.00307567	98.15
4	0.927111	0.05265725	75.96	54	0.994799	0.00301766	98.19
5	0.942162	0.03966147	80.68	55	0.994894	0.00296180	98.22
6	0.952062	0.03180014	83.86	56	0.994986	0.00290798	98.25
7	0.959068	0.02653585	86.14	57	0.995074	0.00285607	98.28
8	0.964288	0.02276529	87.85	58	0.995159	0.00280598	98.31
9	0.968328	0.01993214	89.19	59	0.995241	0.00275762	98.34
10	0.971546	0.01772569	90.26	60	0.995321	0.00271089	98.37
11	0.974171	0.01595881	91.14	61	0.995398	0.00266573	98.40
12	0.976352	0.01451209	91.88	62	0.995472	0.00262205	98.42
13	0.978194	0.01330578	92.50	63	0.995544	0.00257977	98.45
14	0.979769	0.01228455	93.03	64	0.995614	0.00253884	98.47
15	0.981132	0.01140887	93.49	65	0.995682	0.00249918	98.49
16	0.982323	0.01064970	93.90	66	0.995747	0.00246074	98.52
17	0.983373	0.00998524	94.26	67	0.995811	0.00242347	98.54
18	0.984305	0.00939880	94.57	68	0.995873	0.00238732	98.56
19	0.985138	0.00887742	94.86	69	0.995933	0.00235222	98.58
20	0.985887	0.00841083	95.12	70	0.995991	0.00231814	98.60
21	0.986564	0.00799084	95.35	71	0.996047	0.00228503	98.62
22	0.987180	0.00761078	95.56	72	0.996102	0.00225285	98.64
23	0.987741	0.00726524	95.75	73	0.996156	0.00222158	98.66
24	0.988255	0.00694971	95.93	74	0.996208	0.00219116	98.68
25	0.988728	0.00666044	96.09	75	0.996259	0.00216155	98.69
26	0.989164	0.00639428	96.24	76	0.996308	0.00213274	98.71
27	0.989568	0.00614858	96.38	77	0.996356	0.00210468	98.73
28	0.989943	0.00592106	96.51	78	0.996403	0.00207736	98.74
29	0.990291	0.00570977	96.63	79	0.996449	0.00205074	98.76
30	0.990617	0.00551305	96.74	80	0.996493	0.00202478	98.78
31	0.990921	0.00532943	96.85	81	0.996536	0.00199948	98.79
32	0.991206	0.00515764	96.94	82	0.996579	0.00197480	98.81
33	0.991474	0.00499659	97.04	83	0.996620	0.00195073	98.82
34	0.991726	0.00484528	97.12	84	0.996660	0.00192723	98.83
35	0.991963	0.00470287	97.20	85	0.996700	0.00190429	98.85
36	0.992188	0.00456860	97.28	86	0.996738	0.00188189	98.86
37	0.992400	0.00444178	97.36	87	0.996776	0.00186002	98.87
38	0.992600	0.00432180	97.43	88	0.996812	0.00183864	98.89
39	0.992791	0.00420814	97.49	89	0.996848	0.00181775	98.90
40	0.992972	0.00410030	97.55	90	0.996883	0.00179733	98.91
41	0.993144	0.00399785	97.61	91	0.996918	0.00177737	98.92
42	0.993308	0.00390039	97.67	92	0.996951	0.00175784	98.94
43	0.993464	0.00380758	97.72	93	0.996984	0.00173873	98.95
44	0.993613	0.00371908	97.78	94	0.997016	0.00172005	98.96
45	0.993756	0.00363459	97.83	95	0.997048	0.00170175	98.97
46	0.993892	0.00355387	97.87	96	0.997078	0.00168384	98.98
47	0.994022	0.00347665	97.92	97	0.997109	0.00166631	98.99
48	0.994147	0.00340271	97.96	98	0.997138	0.00164913	99.00
49	0.994267	0.00333185	98.00	99	0.997167	0.00163230	99.01
50	0.994382	0.00326389	98.04	100	0.997196	0.00161582	99.02

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED Estimators from m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=3.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.738488	0.46099848	24.10	51	0.995628	0.00221723	98.26
2	0.879208	0.09574886	58.02	52	0.995713	0.00217386	98.29
3	0.921670	0.05191891	71.34	53	0.995794	0.00213214	98.33
4	0.942067	0.03548267	78.29	54	0.995872	0.00209200	98.36
5	0.954041	0.02692497	82.53	55	0.995947	0.00205334	98.39
6	0.961915	0.02168556	85.40	56	0.996020	0.00201608	98.41
7	0.967486	0.01815031	87.45	57	0.996090	0.00198016	98.44
8	0.971635	0.01560494	89.00	58	0.996158	0.00194548	98.47
9	0.974845	0.01368508	90.21	59	0.996223	0.00191201	98.50
10	0.977403	0.01218554	91.18	60	0.996286	0.00187966	98.52
11	0.979489	0.01098199	91.98	61	0.996347	0.00184839	98.54
12	0.981222	0.00999470	92.64	62	0.996406	0.00181814	98.57
13	0.982685	0.00917022	93.20	63	0.996463	0.00178888	98.59
14	0.983936	0.00847135	93.69	64	0.996519	0.00176053	98.61
15	0.985019	0.00787142	94.11	65	0.996572	0.00173307	98.63
16	0.985965	0.00735082	94.47	66	0.996624	0.00170645	98.65
17	0.986799	0.00689480	94.80	67	0.996675	0.00168064	98.67
18	0.987539	0.00649205	95.08	68	0.996724	0.00165560	98.69
19	0.988201	0.00613374	95.34	69	0.996772	0.00163130	98.71
20	0.988796	0.00581291	95.57	70	0.996818	0.00160769	98.73
21	0.989334	0.00552396	95.78	71	0.996863	0.00158476	98.75
22	0.989822	0.00526238	95.97	72	0.996906	0.00156248	98.77
23	0.990268	0.00502445	96.15	73	0.996949	0.00154081	98.78
24	0.990676	0.00480710	96.31	74	0.996990	0.00151973	98.80
25	0.991052	0.00460777	96.46	75	0.997030	0.00149923	98.82
26	0.991398	0.00442431	96.59	76	0.997070	0.00147927	98.83
27	0.991719	0.00425491	96.72	77	0.997108	0.00145984	98.85
28	0.992016	0.00409799	96.83	78	0.997145	0.00144091	98.86
29	0.992293	0.00395223	96.94	79	0.997181	0.00142246	98.88
30	0.992551	0.00381649	97.04	80	0.997216	0.00140448	98.89
31	0.992793	0.00368977	97.14	81	0.997251	0.00138695	98.90
32	0.993019	0.00357118	97.23	82	0.997284	0.00136985	98.92
33	0.993232	0.00345998	97.31	83	0.997317	0.00135316	98.93
34	0.993432	0.00335550	97.39	84	0.997349	0.00133688	98.94
35	0.993620	0.00325714	97.47	85	0.997380	0.00132099	98.96
36	0.993798	0.00316439	97.54	86	0.997411	0.00130547	98.97
37	0.993967	0.00307676	97.60	87	0.997441	0.0129031	98.98
38	0.994126	0.00299387	97.67	88	0.997470	0.00127549	98.99
39	0.994278	0.00291532	97.73	89	0.997498	0.00126102	99.00
40	0.994421	0.00284078	97.78	90	0.997526	0.00124687	99.01
41	0.994558	0.00276997	97.84	91	0.997554	0.00123303	99.02
42	0.994688	0.00270259	97.89	92	0.997580	0.00121950	99.03
43	0.994812	0.00263842	97.94	93	0.997606	0.00120626	99.04
44	0.994930	0.00257722	97.98	94	0.997632	0.00119331	99.06
45	0.995043	0.00251880	98.03	95	0.997657	0.00118063	99.07
46	0.995152	0.00246297	98.07	96	0.997681	0.00116821	99.07
47	0.995255	0.00240956	98.11	97	0.997705	0.00115605	99.08
48	0.995354	0.00235841	98.15	98	0.997729	0.00114416	99.09
49	0.995449	0.00230940	98.19	99	0.997752	0.00113249	99.10
50	0.995541	0.00226238	98.22	100	0.997774	0.00112107	99.11

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=3.5

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.783704	0.26984765	30.25	51	0.996387	0.00162696	98.38
2	0.900060	0.06667202	61.22	52	0.996456	0.00159517	98.41
3	0.935204	0.03704224	73.46	53	0.996523	0.00156459	98.44
4	0.952084	0.02555147	79.87	54	0.996588	0.00153517	98.47
5	0.961992	0.01948312	83.80	55	0.996650	0.00150684	98.50
6	0.968506	0.01573846	86.45	56	0.996710	0.00147953	98.53
7	0.973114	0.01319911	88.35	57	0.996768	0.00145319	98.55
8	0.976547	0.01136444	89.79	58	0.996824	0.00142777	98.58
9	0.979202	0.00997711	90.91	59	0.996878	0.00140323	98.60
10	0.981317	0.00889140	91.81	60	0.996930	0.00137952	98.62
11	0.983042	0.00801866	92.55	61	0.996981	0.00135659	98.65
12	0.984475	0.00730184	93.16	62	0.997029	0.00133441	98.67
13	0.985685	0.00670262	93.69	63	0.997077	0.00131296	98.69
14	0.986720	0.00619425	94.13	64	0.997122	0.00129217	98.71
15	0.987615	0.00575753	94.52	65	0.997167	0.00127204	98.73
16	0.988398	0.00537832	94.86	66	0.997210	0.00125252	98.75
17	0.989087	0.00504597	95.16	67	0.997252	0.00123359	98.77
18	0.989699	0.00475229	95.43	68	0.997292	0.00121523	98.79
19	0.990246	0.00449090	95.67	69	0.997331	0.00119741	98.80
20	0.990738	0.00425677	95.89	70	0.997370	0.00118010	98.82
21	0.991182	0.00404584	96.08	71	0.997407	0.00116327	98.84
22	0.991586	0.00385482	96.26	72	0.997443	0.00114693	98.85
23	0.991955	0.00368102	96.42	73	0.997478	0.00113104	98.87
24	0.992292	0.00352222	96.57	74	0.997512	0.00111558	98.88
25	0.992603	0.00337654	96.71	75	0.997545	0.00110055	98.90
26	0.992889	0.00324244	96.83	76	0.997578	0.00108591	98.91
27	0.993154	0.00311858	96.95	77	0.997609	0.00107165	98.93
28	0.993400	0.00300384	97.06	78	0.997640	0.00105777	98.94
29	0.993629	0.00289724	97.16	79	0.997670	0.00104424	98.95
30	0.993843	0.00279795	97.25	80	0.997699	0.00103105	98.97
31	0.994042	0.00270523	97.34	81	0.997728	0.00101819	98.98
32	0.994230	0.00261846	97.42	82	0.997755	0.00100564	98.99
33	0.994405	0.00253709	97.50	83	0.997783	0.00099341	99.01
34	0.994571	0.00246062	97.58	84	0.997809	0.00098146	99.02
35	0.994727	0.00238863	97.64	85	0.997835	0.00096980	99.03
36	0.994874	0.00232072	97.71	86	0.997860	0.00095841	99.04
37	0.995013	0.00225657	97.77	87	0.997885	0.00094730	99.05
38	0.995145	0.00219588	97.83	88	0.997909	0.00093643	99.06
39	0.995270	0.00213836	97.89	89	0.997932	0.00092581	99.07
40	0.995389	0.00208378	97.94	90	0.997955	0.00091542	99.08
41	0.995502	0.00203191	97.99	91	0.997978	0.00090528	99.09
42	0.995609	0.00198257	98.04	92	0.998000	0.00089534	99.10
43	0.995712	0.00193556	98.08	93	0.998021	0.00088563	99.11
44	0.995809	0.00189073	98.13	94	0.998042	0.00087613	99.12
45	0.995903	0.00184793	98.17	95	0.998063	0.00086682	99.13
46	0.995992	0.00180703	98.21	96	0.998083	0.00085771	99.14
47	0.996078	0.00176790	98.24	97	0.998103	0.00084879	99.15
48	0.996160	0.00173042	98.28	98	0.998123	0.00084006	99.16
49	0.996239	0.00169450	98.32	99	0.998142	0.00083151	99.17
50	0.996314	0.00166004	98.35	100	0.998160	0.00082312	99.17

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER **v** OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=4.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.816049	0.18034060	34.66	51	0.996926	0.00124452	98.47
2	0.914950	0.04919164	63.53	52	0.996985	0.00122022	98.50
3	0.944858	0.02777956	75.00	53	0.997042	0.00119685	98.53
4	0.959225	0.01928552	81.02	54	0.997097	0.00117436	98.56
5	0.967658	0.01475536	84.71	55	0.997150	0.00115270	98.58
6	0.973201	0.01194441	87.21	56	0.997201	0.00113183	98.61
7	0.977124	0.01003147	89.01	57	0.997250	0.00111170	98.63
8	0.980044	0.00864597	90.36	58	0.997298	0.00109227	98.66
9	0.982304	0.00759638	91.42	59	0.997344	0.00107351	98.68
10	0.984104	0.00677386	92.27	60	0.997388	0.00105538	98.70
11	0.985572	0.00611194	92.96	61	0.997431	0.00103786	98.72
12	0.986791	0.00556780	93.54	62	0.997473	0.00102091	98.74
13	0.987821	0.00511259	94.04	63	0.997513	0.00100449	98.76
14	0.988701	0.00472616	94.46	64	0.997552	0.00098861	98.78
15	0.989463	0.00439402	94.83	65	0.997590	0.00097322	98.80
16	0.990129	0.00410548	95.15	66	0.997626	0.00095829	98.82
17	0.990715	0.00385249	95.43	67	0.997662	0.00094382	98.84
18	0.991236	0.00362886	95.68	68	0.997696	0.00092978	98.85
19	0.991702	0.00342977	95.91	69	0.997730	0.00091615	98.87
20	0.992120	0.00325139	96.11	70	0.997762	0.00090291	98.89
21	0.992498	0.00309063	96.30	71	0.997794	0.00089006	98.90
22	0.992842	0.00294503	96.46	72	0.997825	0.00087756	98.92
23	0.993156	0.00281252	96.62	73	0.997855	0.00086541	98.93
24	0.993443	0.00269142	96.76	74	0.997884	0.00085359	98.95
25	0.993707	0.00258032	96.89	75	0.997912	0.00084209	98.96
26	0.993951	0.00247803	97.01	76	0.997939	0.00083090	98.97
27	0.994176	0.00238353	97.12	77	0.997966	0.00082000	98.99
28	0.994385	0.00229598	97.22	78	0.997992	0.00080938	99.00
29	0.994580	0.00221463	97.31	79	0.998018	0.00079903	99.01
30	0.994762	0.00213885	97.40	80	0.998043	0.00078894	99.02
31	0.994932	0.00206808	97.49	81	0.998067	0.00077911	99.04
32	0.995091	0.00200184	97.57	82	0.998091	0.00076951	99.05
33	0.995240	0.00193972	97.64	83	0.998114	0.00076015	99.06
34	0.995381	0.00188134	97.71	84	0.998136	0.00075102	99.07
35	0.995514	0.00182637	97.77	85	0.998158	0.00074210	99.08
36	0.995639	0.00177451	97.84	86	0.998180	0.00073340	99.09
37	0.995757	0.00172552	97.89	87	0.998200	0.00072489	99.10
38	0.995870	0.00167917	97.95	88	0.998221	0.00071658	99.11
39	0.995976	0.00163524	98.00	89	0.998241	0.00070845	99.12
40	0.996077	0.00159355	98.05	90	0.998261	0.00070052	99.13
41	0.996173	0.00155393	98.10	91	0.998280	0.00069275	99.14
42	0.996264	0.00151623	98.14	92	0.998298	0.00068516	99.15
43	0.996352	0.00148032	98.19	93	0.998317	0.00067773	99.16
44	0.996435	0.00144607	98.23	94	0.998335	0.00067046	99.17
45	0.996514	0.00141337	98.27	95	0.998352	0.00066334	99.18
46	0.996591	0.00138212	98.31	96	0.998369	0.00065637	99.19
47	0.996663	0.00135221	98.34	97	0.998386	0.00064955	99.20
48	0.996733	0.00132358	98.38	98	0.998403	0.00064287	99.20
49	0.996800	0.00129613	98.41	99	0.998419	0.00063632	99.21
50	0.996864	0.00126980	98.44	100	0.998435	0.00062991	99.22

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=5.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.858937	0.09868553	40.53	51	0.997639	0.00079551	98.59
2	0.934685	0.03001769	66.63	52	0.997685	0.00078000	98.62
3	0.957645	0.01730143	77.06	53	0.997728	0.00076509	98.64
4	0.968679	0.01211111	82.57	54	0.997771	0.00075073	98.67
5	0.975157	0.00930747	85.95	55	0.997811	0.00073690	98.69
6	0.979415	0.00755521	88.24	56	0.997851	0.00072357	98.72
7	0.982428	0.00635716	89.89	57	0.997888	0.00071071	98.74
8	0.984672	0.00548661	91.13	58	0.997925	0.00069831	98.76
9	0.986408	0.00482554	92.10	59	0.997960	0.00068633	98.78
10	0.987790	0.00430652	92.88	60	0.997994	0.00067475	98.80
11	0.988918	0.00388823	93.52	61	0.998027	0.00066355	98.82
12	0.989855	0.00354397	94.06	62	0.998059	0.00065272	98.84
13	0.990645	0.00325567	94.51	63	0.998090	0.00064225	98.86
14	0.991322	0.00301073	94.90	64	0.998120	0.00063209	98.88
15	0.991907	0.00280006	95.24	65	0.998149	0.00062227	98.89
16	0.992418	0.00261694	95.53	66	0.998177	0.00061273	98.91
17	0.992869	0.00245629	95.79	67	0.998204	0.00060349	98.93
18	0.993269	0.00231422	96.02	68	0.998231	0.00059452	98.94
19	0.993626	0.00218768	96.23	69	0.998256	0.00058581	98.96
20	0.993948	0.00207426	96.42	70	0.998281	0.00057735	98.97
21	0.994238	0.00197201	96.59	71	0.998306	0.00056914	98.99
22	0.994502	0.00187938	96.74	72	0.998329	0.00056116	99.00
23	0.994743	0.00179505	96.88	73	0.998352	0.00055339	99.02
24	0.994964	0.00171797	97.01	74	0.998375	0.00054584	99.03
25	0.995167	0.00164723	97.13	75	0.998396	0.00053849	99.04
26	0.995354	0.00158209	97.24	76	0.998417	0.00053134	99.05
27	0.995527	0.00152190	97.34	77	0.998438	0.00052437	99.07
28	0.995688	0.00146612	97.44	78	0.998458	0.00051758	99.08
29	0.995837	0.00141428	97.53	79	0.998478	0.00051098	99.09
30	0.995977	0.00136600	97.61	80	0.998497	0.00050453	99.10
31	0.996107	0.00132089	97.69	81	0.998515	0.00049825	99.11
32	0.996230	0.00127867	97.76	82	0.998533	0.00049212	99.12
33	0.996344	0.00123906	97.83	83	0.998551	0.00048614	99.13
34	0.996453	0.00120184	97.89	84	0.998568	0.00048030	99.14
35	0.996554	0.00116678	97.95	85	0.998585	0.00047460	99.15
36	0.996651	0.00113371	98.01	86	0.998602	0.00046904	99.16
37	0.996742	0.00110247	98.06	87	0.998618	0.00046360	99.17
38	0.996828	0.00107290	98.11	88	0.998634	0.00045829	99.18
39	0.996909	0.00104488	98.16	89	0.998649	0.00045309	99.19
40	0.996987	0.00101828	98.20	90	0.998664	0.00044802	99.20
41	0.997061	0.00099300	98.25	91	0.998679	0.00044306	99.21
42	0.997131	0.00096895	98.29	92	0.998693	0.00043821	99.22
43	0.997198	0.00094603	98.33	93	0.998707	0.00043345	99.23
44	0.997262	0.00092417	98.37	94	0.998721	0.00042881	99.23
45	0.997323	0.00090330	98.40	95	0.998735	0.00042426	99.24
46	0.997381	0.00088336	98.44	96	0.998748	0.00041981	99.25
47	0.997437	0.00086427	98.47	97	0.998761	0.00041544	99.26
48	0.997491	0.00084599	98.50	98	0.998773	0.00041118	99.27
49	0.997542	0.00082847	98.53	99	0.998786	0.00040700	99.27
50	0.997592	0.00081166	98.56	100	0.998798	0.00040290	99.28

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM **m** ORDER STATISTICS OF SCALE PARAMETER **v** OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=6.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.885907	0.06275332	44.27	51	0.998087	0.00055201	98.67
2	0.947104	0.02024318	68.61	52	0.998124	0.00054125	98.69
3	0.965690	0.01181142	78.39	53	0.998160	0.00053091	98.72
4	0.974626	0.00831035	83.56	54	0.998194	0.00052095	98.74
5	0.979873	0.00640427	86.75	55	0.998227	0.00051136	98.77
6	0.983323	0.00520760	88.90	56	0.998258	0.00050212	98.79
7	0.985764	0.00438702	90.45	57	0.998289	0.00049320	98.81
8	0.987581	0.00378953	91.63	58	0.998319	0.00048460	98.83
9	0.988988	0.00333512	92.54	59	0.998347	0.00047629	98.85
10	0.990108	0.00297793	93.28	60	0.998375	0.00046826	98.87
11	0.991021	0.00268980	93.88	61	0.998402	0.00046050	98.89
12	0.991780	0.00245248	94.39	62	0.998428	0.00045299	98.90
13	0.992421	0.00225362	94.81	63	0.998453	0.00044572	98.92
14	0.992969	0.00208458	95.18	64	0.998477	0.00043868	98.94
15	0.993443	0.00193912	95.50	65	0.998500	0.00043186	98.95
16	0.993857	0.00181263	95.78	66	0.998523	0.00042525	98.97
17	0.994222	0.00170162	96.03	67	0.998545	0.00041883	98.99
18	0.994546	0.00160342	96.24	68	0.998567	0.00041261	99.00
19	0.994836	0.00151594	96.44	69	0.998587	0.00040658	99.02
20	0.995097	0.00143751	96.62	70	0.998608	0.00040071	99.03
21	0.995332	0.00136679	96.78	71	0.998627	0.00039501	99.04
22	0.995546	0.00130270	96.92	72	0.998646	0.00038947	99.06
23	0.995741	0.00124435	97.06	73	0.998665	0.00038409	99.07
24	0.995920	0.00119101	97.18	74	0.998683	0.00037885	99.08
25	0.996084	0.00114205	97.29	75	0.998701	0.00037375	99.09
26	0.996236	0.00109696	97.39	76	0.998718	0.00036879	99.11
27	0.996376	0.00105529	97.49	77	0.998735	0.00036396	99.12
28	0.996506	0.00101667	97.58	78	0.998751	0.00035925	99.13
29	0.996627	0.00098077	97.66	79	0.998767	0.00035466	99.14
30	0.996740	0.00094733	97.74	80	0.998782	0.00035019	99.15
31	0.996846	0.00091609	97.81	81	0.998797	0.00034583	99.16
32	0.996945	0.00088684	97.88	82	0.998812	0.00034158	99.17
33	0.997038	0.00085941	97.95	83	0.998826	0.00033743	99.18
34	0.997126	0.00083362	98.01	84	0.998840	0.00033338	99.19
35	0.997208	0.00080933	98.06	85	0.998854	0.00032943	99.20
36	0.997286	0.00078642	98.12	86	0.998867	0.00032557	99.21
37	0.997360	0.00076477	98.17	87	0.998880	0.00032180	99.22
38	0.997430	0.00074428	98.21	88	0.998893	0.00031811	99.23
39	0.997496	0.00072486	98.26	89	0.998905	0.00031451	99.24
40	0.997559	0.00070643	98.30	90	0.998918	0.00031099	99.24
41	0.997619	0.00068890	98.34	91	0.998930	0.00030755	99.25
42	0.997676	0.00067224	98.38	92	0.998941	0.00030418	99.26
43	0.997730	0.00065635	98.42	93	0.998953	0.00030088	99.27
44	0.997782	0.00064120	98.46	94	0.998964	0.00029766	99.28
45	0.997831	0.00062674	98.49	95	0.998975	0.00029450	99.28
46	0.997878	0.00061291	98.52	96	0.998985	0.00029141	99.29
47	0.997924	0.00059967	98.56	97	0.998996	0.00028839	99.30
48	0.997967	0.00058700	98.59	98	0.999006	0.00028542	99.31
49	0.998009	0.00057486	98.61	99	0.999016	0.00028252	99.31
50	0.998049	0.00056320	98.64	100	0.999026	0.00027967	99.32

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=7.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.904350	0.04356829	46.84	51	0.998394	0.00040533	98.72
2	0.955606	0.01458028	69.99	52	0.998425	0.00039744	98.75
3	0.971198	0.00857685	79.31	53	0.998455	0.00038985	98.77
4	0.978698	0.00605541	84.26	54	0.998483	0.00038254	98.79
5	0.983102	0.00467536	87.30	55	0.998511	0.00037550	98.82
6	0.985998	0.00380626	89.36	56	0.998538	0.00036872	98.84
7	0.988047	0.00320911	90.85	57	0.998563	0.00036217	98.86
8	0.989573	0.00277369	91.97	58	0.998588	0.00035586	98.88
9	0.990754	0.00244220	92.85	59	0.998612	0.00034976	98.90
10	0.991694	0.00218141	93.55	60	0.998636	0.00034387	98.91
11	0.992461	0.00197092	94.13	61	0.998658	0.00033817	98.93
12	0.993098	0.00179745	94.62	62	0.998680	0.00033265	98.95
13	0.993636	0.00165202	95.03	63	0.998701	0.00032732	98.97
14	0.994097	0.00152837	95.38	64	0.998721	0.00032216	98.98
15	0.994495	0.00142192	95.68	65	0.998741	0.00031715	99.00
16	0.994842	0.00132933	95.95	66	0.998760	0.00031230	99.01
17	0.995149	0.00124806	96.19	67	0.998778	0.00030759	99.03
18	0.995421	0.00117616	96.40	68	0.998796	0.00030302	99.04
19	0.995664	0.00111208	96.59	69	0.998814	0.00029859	99.06
20	0.995883	0.00105462	96.76	70	0.998831	0.00029428	99.07
21	0.996081	0.00100281	96.91	71	0.998847	0.00029010	99.08
22	0.996260	0.00095585	97.05	72	0.998863	0.00028604	99.09
23	0.996424	0.00091309	97.18	73	0.998879	0.00028208	99.11
24	0.996574	0.00087399	97.29	74	0.998894	0.00027823	99.12
25	0.996712	0.00083811	97.40	75	0.998909	0.00027449	99.13
26	0.996839	0.00080505	97.50	76	0.998923	0.00027085	99.14
27	0.996957	0.00077450	97.59	77	0.998937	0.00026730	99.15
28	0.997066	0.00074618	97.68	78	0.998951	0.00026385	99.16
29	0.997168	0.00071987	97.76	79	0.998964	0.00026048	99.17
30	0.997263	0.00069534	97.83	80	0.998977	0.00025719	99.18
31	0.997352	0.00067243	97.90	81	0.998990	0.00025399	99.19
32	0.997435	0.00065099	97.97	82	0.999002	0.00025087	99.20
33	0.997513	0.00063086	98.03	83	0.999014	0.00024782	99.21
34	0.997587	0.00061195	98.09	84	0.999026	0.00024485	99.22
35	0.997656	0.00059413	98.14	85	0.999038	0.00024195	99.23
36	0.997721	0.00057732	98.19	86	0.999049	0.00023911	99.24
37	0.997783	0.00056145	98.24	87	0.999060	0.00023635	99.25
38	0.997842	0.00054641	98.29	88	0.999071	0.00023364	99.26
39	0.997898	0.00053217	98.33	89	0.999081	0.00023100	99.27
40	0.997950	0.00051864	98.37	90	0.999091	0.00022841	99.28
41	0.998001	0.00050579	98.41	91	0.999101	0.00022588	99.28
42	0.998048	0.00049356	98.45	92	0.999111	0.00022341	99.29
43	0.998094	0.00048190	98.49	93	0.999121	0.00022099	99.30
44	0.998137	0.00047079	98.52	94	0.999130	0.00021862	99.31
45	0.998179	0.00046017	98.55	95	0.999139	0.00021631	99.31
46	0.998219	0.00045002	98.58	96	0.999148	0.00021403	99.32
47	0.998257	0.00044031	98.61	97	0.999157	0.00021181	99.33
48	0.998293	0.00043102	98.64	98	0.999166	0.00020964	99.33
49	0.998328	0.00042210	98.67	99	0.999174	0.00020751	99.34
50	0.998362	0.00041354	98.70	100	0.999182	0.00020542	99.35

UNBIASING FACTORS FOR ML ESTIMATORS AND VARIANCES AND EFFICIENCIES OF UNBIASED ESTIMATORS FROM m ORDER STATISTICS OF SCALE PARAMETER v OF TYPE 2 E-V POPULATION

SHAPE PARAMETER K=8.0

m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$	m	$\tilde{v}/\hat{v}$	$var(\tilde{v})/v^2$	$Eff(\tilde{v})$
1	0.917724	0.03206694	48.73	51	0.998617	0.00031020	98.76
2	0.961779	0.01100435	70.99	52	0.998643	0.00030417	98.79
3	0.975197	0.00651100	79.99	53	0.998669	0.00029836	98.81
4	0.981654	0.00460833	84.76	54	0.998694	0.00029277	98.83
5	0.985447	0.00356296	87.71	55	0.998718	0.00028738	98.85
6	0.987941	0.00290315	89.70	56	0.998741	0.00028220	98.87
7	0.989705	0.00244914	91.14	57	0.998763	0.00027719	98.89
8	0.991020	0.00211775	92.23	58	0.998784	0.00027236	98.91
9	0.992036	0.00186527	93.08	59	0.998805	0.00026769	98.93
10	0.992846	0.00166652	93.76	60	0.998825	0.00026318	98.95
11	0.993507	0.00150603	94.32	61	0.998844	0.00025883	98.96
12	0.994056	0.00137371	94.79	62	0.998863	0.00025461	98.98
13	0.994519	0.00126275	95.18	63	0.998881	0.00025053	99.00
14	0.994915	0.00116838	95.52	64	0.998898	0.00024657	99.01
15	0.995258	0.00108712	95.82	65	0.998915	0.00024274	99.03
16	0.995558	0.00101642	96.08	66	0.998932	0.00023903	99.04
17	0.995822	0.00095436	96.31	67	0.998948	0.00023542	99.06
18	0.996056	0.00089944	96.51	68	0.998963	0.00023193	99.07
19	0.996266	0.00085049	96.69	69	0.998978	0.00022854	99.08
20	0.996454	0.00080660	96.86	70	0.998993	0.00022525	99.10
21	0.996624	0.00076701	97.01	71	0.999007	0.00022204	99.11
22	0.996779	0.00073113	97.14	72	0.999021	0.00021893	99.12
23	0.996920	0.00069845	97.26	73	0.999035	0.00021590	99.13
24	0.997049	0.00066857	97.38	74	0.999048	0.00021296	99.15
25	0.997168	0.00064114	97.48	75	0.999060	0.00021010	99.16
26	0.997278	0.00061587	97.58	76	0.999073	0.00020731	99.17
27	0.997379	0.00059252	97.67	77	0.999085	0.00020460	99.18
28	0.997473	0.00057087	97.75	78	0.999097	0.00020196	99.19
29	0.997561	0.00055075	97.83	79	0.999108	0.00019938	99.20
30	0.997643	0.00053200	97.90	80	0.999119	0.00019687	99.21
31	0.997719	0.00051448	97.97	81	0.999130	0.00019442	99.22
32	0.997791	0.00049809	98.03	82	0.999141	0.00019202	99.23
33	0.997858	0.00048270	98.09	83	0.999151	0.00018969	99.24
34	0.997921	0.00046824	98.15	84	0.999161	0.00018742	99.25
35	0.997981	0.00045461	98.20	85	0.999171	0.00018520	99.26
36	0.998037	0.00044176	98.25	86	0.999181	0.00018302	99.27
37	0.998091	0.00042962	98.30	87	0.999190	0.00018091	99.27
38	0.998141	0.00041812	98.34	88	0.999199	0.00017884	99.28
39	0.998189	0.00040723	98.38	89	0.999208	0.00017682	99.29
40	0.998235	0.00039688	98.42	90	0.999217	0.00017484	99.30
41	0.998278	0.00038705	98.46	91	0.999226	0.00017290	99.31
42	0.998319	0.00037769	98.50	92	0.999234	0.00017101	99.31
43	0.998358	0.00036878	98.53	93	0.999243	0.00016916	99.32
44	0.998396	0.00036027	98.57	94	0.999251	0.00016735	99.33
45	0.998431	0.00035216	98.60	95	0.999259	0.00016557	99.33
46	0.998466	0.00034440	98.63	96	0.999266	0.00016384	99.34
47	0.998498	0.00033697	98.66	97	0.999274	0.00016213	99.35
48	0.998530	0.00032985	98.69	98	0.999281	0.00016047	99.36
49	0.998560	0.00032303	98.71	99	0.999289	0.00015884	99.36
50	0.998589	0.00031649	98.74	100	0.999296	0.00015724	99.37

Appendix F

TABLES OF ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS FROM DOUBLY CENSORED SAMPLES

SOURCES OF TABLES

Table F1	*Biometrika* 53(1966), 205–213 (Harter and Moore)
Table F2	*J. Amer. Statist. Assoc.* 61(1966), 842–851; Corrigendum, 1247 (Harter and Moore) [with additional values not previously published (Harter and Moore)]
Tables F3, F4	*Ann. Math. Statist.* 38(1967), 557–570 (Harter and Moore)
Table F5	ARL 66–0158 (Harter)
Table F6	*J. Amer. Statist. Assoc.* 62(1967), 675–684 (Harter and Moore)
Table F7	*J. Amer. Statist. Assoc.* 63(1968), 889–901 (Harter and Moore)

Table F1

COEFFICIENTS IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS μ AND σ OF NORMAL POPULATION FROM SAMPLES OF SIZE n WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

COEFFICIENTS OF σ^2/N IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS μ AND σ OF NORMAL POPULATION FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

		(BOTH PARAMETERS UNKNOWN)			(σ KNOWN)	(μ KNOWN)
Q1	Q2	N VAR$(\hat{\mu})/\sigma^2$	N COV$(\hat{\mu},\hat{\sigma})/\sigma^2$	N VAR$(\hat{\sigma})/\sigma^2$	N VAR$(\hat{\mu})/\sigma^2$	N VAR$(\hat{\sigma})/\sigma^2$
0.0	0.0	1.000000	0.000000	0.500000	1.000000	0.500000
0.0	0.1	1.020092	0.041136	0.585925	1.017205	0.584266
0.0	0.2	1.062323	0.106905	0.688692	1.045728	0.677934
0.0	0.3	1.138257	0.206568	0.819749	1.086204	0.782262
0.0	0.4	1.272656	0.359824	0.994759	1.142501	0.893025
0.0	0.5	1.517094	0.605233	1.241453	1.222031	1.000000
0.0	0.6	1.990850	1.025933	1.615494	1.339322	1.086805
0.0	0.7	3.019940	1.632190	2.247997	1.526647	1.136413
0.0	0.8	5.780392	3.717327	3.537484	1.874080	1.146899
0.0	0.9	17.794599	10.620022	7.513928	2.784491	1.175776
0.1	0.1	1.035011	0.000000	0.702692	1.035011	0.702692
0.1	0.2	1.070615	0.071658	0.847527	1.064557	0.842731
0.1	0.3	1.140391	0.187749	1.041120	1.106533	1.010210
0.1	0.4	1.274494	0.379562	1.315918	1.165014	1.202879
0.1	0.5	1.542208	0.715075	1.736943	1.247822	1.405385
0.1	0.6	2.128202	1.364988	2.458565	1.370365	1.583087
0.1	0.7	3.665653	2.880735	3.954475	1.567111	1.690586
0.1	0.8	9.774446	8.237227	8.655663	1.935427	1.713898
0.2	0.2	1.095839	0.000000	1.052478	1.095839	1.052478
0.2	0.3	1.152548	0.127812	1.341466	1.140370	1.327293
0.2	0.4	1.275501	0.360575	1.783003	1.202582	1.681071
0.2	0.5	1.556437	0.820702	2.537708	1.291020	2.104956
0.2	0.6	2.301737	1.897104	4.093984	1.422641	2.530381
0.2	0.7	5.184839	5.628780	8.927385	1.635853	2.816652
0.3	0.3	1.188673	0.000000	1.796338	1.188673	1.796338
0.3	0.4	1.285467	0.273191	2.569779	1.256424	2.511720
0.3	0.5	1.565414	0.938941	4.155856	1.353277	3.592676
0.3	0.6	2.689726	3.281978	9.043125	1.498614	5.038488
0.4	0.4	1.332365	0.000000	4.173987	1.332365	4.173987
0.4	0.5	1.569895	1.079093	9.089706	1.441790	8.347974

(INTERCHANGING Q1 AND Q2 LEAVES VARIANCES AND ABSOLUTE VALUE OF COVARIANCE UNCHANGED, BUT CHANGES SIGN OF COVARIANCE)

Table F2

COEFFICIENTS IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS μ, σ AND τ OF LOGNORMAL POPULATION FROM SAMPLES OF SIZE n WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

A. $\sigma = 1$

Q1	Q2	N VAR($\hat{\mu}$)	N VAR($\hat{\sigma}$)	$\frac{\text{N VAR}(\hat{\tau})}{\text{EXP}(2\mu-4)}$	N COV($\hat{\mu}$, $\hat{\sigma}$)	$\frac{\text{N COV}(\hat{\mu}, \hat{\tau})}{\text{EXP}(\mu-2)}$	$\frac{\text{N COV}(\hat{\sigma}, \hat{\tau})}{\text{EXP}(\mu-2)}$
0.00	0.0	1.410414	0.910414	8.243387	-0.410414	-1.839348	1.839348
0.00	0.1	1.412588	1.146076	8.901992	-0.427754	-1.869223	2.233038
0.00	0.2	1.414626	1.434485	9.568442	-0.405682	-1.836026	2.671344
0.00	0.3	1.429019	1.818560	10.330370	-0.332334	-1.733111	3.212178
0.00	0.4	1.478482	2.358012	11.249300	-0.169886	-1.521643	3.916075
0.00	0.5	1.618193	3.163315	12.414950	0.164441	-1.120328	4.884651
0.00	0.6	1.999588	4.467645	13.987247	0.868068	-0.349597	6.316150
0.00	0.7	3.115817	6.853719	16.302302	2.496707	1.250207	8.665095
0.00	0.8	7.115683	12.229846	20.249630	7.124206	5.199917	13.267144
0.00	0.9	31.407288	31.443446	29.512080	28.668431	20.043421	26.574609
0.01	0.0	1.777448	1.188926	16.582264	-0.729769	-3.588245	3.359194
0.01	0.1	1.808473	1.568272	18.764757	-0.836072	-3.844798	4.268600
0.01	0.2	1.818528	2.051113	21.113066	-0.903977	-3.995210	5.333216
0.01	0.3	1.819907	2.727682	23.991118	-0.927218	-4.043905	6.728391
0.01	0.4	1.825317	3.737812	27.755774	-0.859376	-3.914049	8.678105
0.01	0.5	1.874389	5.363918	33.027651	-0.581240	-3.415193	11.605384
0.01	0.6	2.109547	8.268538	41.100989	0.239625	-2.050745	16.446600
0.01	0.7	3.135404	14.362138	55.265556	2.729248	1.734025	25.733631
0.01	0.8	8.554546	31.444398	87.020906	12.318465	14.763655	49.010430
0.01	0.9	68.049468	129.28688	218.08099	88.370847	102.33117	162.11335
0.02	0.0	1.982316	1.317602	21.791553	-0.892116	-4.621259	4.177695
0.02	0.1	2.041723	1.773131	25.129949	-1.054644	-5.063234	5.410237
0.02	0.2	2.070846	2.362711	28.795805	-1.184340	-5.387484	6.880097
0.02	0.3	2.082860	3.206757	33.399397	-1.282091	-5.616773	8.850969
0.02	0.4	2.084254	4.500022	39.598571	-1.303527	-5.665201	11.681932
0.02	0.5	2.101512	6.650618	48.598897	-1.121588	-5.295680	16.080598
0.02	0.6	2.254557	10.661227	63.053861	-0.348631	-3.834051	23.692701
0.02	0.7	3.149650	19.617860	90.209795	2.464325	1.047586	39.283045
0.02	0.8	9.115507	47.545382	158.47117	15.315516	21.066673	82.921684
0.02	0.9	102.58354	257.10173	531.39495	154.77808	206.21759	362.18770
0.05	0.0	2.522554	1.613960	37.010394	-1.292131	-7.488117	6.299471
0.05	0.1	2.689855	2.268699	44.400142	-1.621216	-8.596862	8.498017
0.05	0.2	2.811150	3.148450	52.854782	-1.946760	-9.607481	11.224782
0.05	0.3	2.907809	4.469320	64.020049	-2.302199	-10.642625	15.064459
0.05	0.4	2.973894	6.614480	80.004008	-2.674170	-11.660722	20.919094
0.05	0.5	2.999411	10.457280	105.09468	-2.968286	-12.417451	30.736531
0.05	0.6	3.011875	18.391847	149.92022	-2.761610	-11.938437	49.591423
0.05	0.7	3.439670	39.084595	248.86461	0.133599	-5.646706	94.826016
0.05	0.8	10.105184	125.22396	583.44947	23.867431	40.910795	264.51545
0.05	0.9	384.34840	1821.0122	5380.7591	817.36166	1370.3050	3114.8512
0.10	0.0	3.452578	2.044686	67.248898	-1.924859	-12.789917	9.904549
0.10	0.1	3.897738	3.047913	84.899904	-2.591086	-15.589908	14.110599
0.10	0.2	4.305458	4.469161	106.20027	-3.351121	-18.534864	19.611692
0.10	0.3	4.741352	6.750278	136.26962	-4.346395	-22.151787	27.892379
0.10	0.4	5.219343	10.777561	183.07459	-5.729836	-26.873808	41.619543
0.10	0.5	5.730231	18.838010	265.21225	-7.747765	-33.327389	67.345471
0.10	0.6	6.200764	38.384658	437.74036	-10.730930	-42.222325	125.40455
0.10	0.7	6.397504	105.14187	937.06877	-13.745415	-50.595771	307.92783
0.10	0.8	10.476445	620.11852	4059.9720	28.955482	53.386278	1575.6021

Q1	Q2	N VAR($\hat{\mu}\|\tau$)	N VAR($\hat{\sigma}\|\tau$)	N COV($\hat{\mu},\hat{\sigma}\|\tau$)	N VAR($\hat{\mu}\|\sigma$)	N VAR($\hat{\tau}\|\sigma$) / EXP($2\mu-4$)	N COV($\hat{\mu},\hat{\tau}\|\sigma$) / EXP($\mu-2$)
0.00	0.0	1.000000	0.500000	0.000000	1.225400	4.527273	-1.010171
0.00	0.1	1.020092	0.585925	0.041136	1.252937	4.551094	-1.035779
0.00	0.2	1.062323	0.688692	0.106905	1.299896	4.593782	-1.080552
0.00	0.3	1.138257	0.819749	0.206568	1.368286	4.656604	-1.146099
0.00	0.4	1.272656	0.994759	0.359824	1.466243	4.745670	-1.239504
0.00	0.5	1.517094	1.241453	0.605233	1.609644	4.872287	-1.374250
0.00	0.6	1.990850	1.615494	1.025933	1.830922	5.057767	-1.576831
0.00	0.7	3.019940	2.247997	1.832190	2.206304	5.347102	-1.906357
0.00	0.8	5.780392	3.537484	3.717327	2.965645	5.857208	-2.528543
0.00	0.9	17.794599	7.513928	10.620022	5.268965	7.052396	-4.185868
0.01	0.0	1.000986	0.508429	-0.002871	1.329512	7.091192	-1.526355
0.01	0.1	1.020695	0.597252	0.038541	1.362749	7.146269	-1.569136
0.01	0.2	1.062517	0.703928	0.105223	1.420122	7.245865	-1.644727
0.01	0.3	1.138273	0.840682	0.206909	1.504718	7.394152	-1.756729
0.01	0.4	1.273368	1.024521	0.364388	1.627734	7.607756	-1.918830
0.01	0.5	1.521244	1.285973	0.618804	1.811405	7.918218	-2.157621
0.01	0.6	2.007225	1.687415	1.060233	2.102603	8.387750	-2.527374
0.01	0.7	3.080997	2.379633	1.921823	2.616763	9.156838	-3.156156
0.01	0.8	6.049798	3.841579	4.003531	3.728740	10.631390	-4.436371
0.01	0.9	20.032136	8.777806	12.301642	7.645760	14.806396	-8.477405
0.02	0.0	1.002301	0.516689	-0.006167	1.378286	8.545415	-1.792644
0.02	0.1	1.021572	0.608359	0.035421	1.414429	8.622050	-1.845267
0.02	0.2	1.062887	0.718869	0.102876	1.477180	8.761301	-1.938745
0.02	0.3	1.138288	0.861216	0.206376	1.570268	8.969843	-2.078075
0.02	0.4	1.273758	1.053747	0.367758	1.706660	9.272597	-2.281281
0.02	0.5	1.524457	1.329805	0.630667	1.912362	9.717450	-2.583779
0.02	0.6	2.021424	1.758614	1.092026	2.243157	10.401000	-3.059279
0.02	0.7	3.137485	2.511540	2.008140	2.840090	11.548939	-3.887010
0.02	0.8	6.314968	4.155751	4.292161	4.182009	13.851328	-5.644404
0.02	0.9	22.557009	10.242164	14.224477	9.405429	21.169185	-11.823398
0.05	0.0	1.007523	0.541739	-0.017592	1.488079	12.422837	-2.444784
0.05	0.1	1.025310	0.642211	0.024190	1.531331	12.568559	-2.524166
0.05	0.2	1.064786	0.764640	0.093583	1.607424	12.836445	-2.666938
0.05	0.3	1.138591	0.924525	0.202101	1.721920	13.243212	-2.882746
0.05	0.4	1.274324	1.144648	0.374824	1.892753	13.844841	-3.203336
0.05	0.5	1.532228	1.467916	0.663386	2.156867	14.752414	-3.692924
0.05	0.6	2.061194	1.987727	1.187450	2.597208	16.202857	-4.492084
0.05	0.7	3.311547	2.952606	2.285190	3.439213	18.800224	-5.970842
0.05	0.8	7.236567	5.301972	5.319917	5.556101	24.703201	-9.505307
0.05	0.9	35.376143	17.865569	24.110026	17.475472	52.789498	-27.796554
0.10	0.0	1.020092	0.585925	-0.041136	1.640523	19.270832	-3.465814
0.10	0.1	1.035011	0.702692	0.000000	1.695009	19.573561	-3.594233
0.10	0.2	1.070615	0.847527	0.071658	1.792679	20.139713	-3.829383
0.10	0.3	1.140391	1.041120	0.187749	1.942779	21.017367	-4.192337
0.10	0.4	1.274494	1.315918	0.379562	2.173104	22.353037	-4.746987
0.10	0.5	1.542208	1.736943	0.715075	2.543702	24.453676	-5.629301
0.10	0.6	2.128202	2.458565	1.364988	3.200793	28.037583	-7.163854
0.10	0.7	3.665653	3.954475	2.880735	4.600538	35.243948	-10.339726
0.10	0.8	9.774446	8.655663	8.237227	9.124413	56.669411	-20.184043

Q1	Q2	N VAR($\hat{\sigma}\|\mu$)	N VAR($\hat{\tau}\|\mu$) / EXP($2\mu-4$)	N COV($\hat{\sigma},\hat{\tau}\|\mu$) / EXP($\mu-2$)	N VAR($\hat{\mu}\|\sigma,\tau$)	N VAR($\hat{\sigma}\|\mu,\tau$)	N VAR($\hat{\tau}\|\mu,\sigma$) / EXP($2\mu-4$)
0.00	0.0	0.790988	5.844657	1.304119	1.000000	0.500000	3.694528
0.00	0.1	1.016546	6.428522	1.667009	1.017205	0.584266	3.694834
0.00	0.2	1.318145	7.185487	2.144814	1.045728	0.677934	3.695562
0.00	0.3	1.741272	8.228456	2.809123	1.086204	0.782262	3.696613
0.00	0.4	2.338491	9.683236	3.741229	1.142501	0.893025	3.697842
0.00	0.5	3.146604	11.639310	4.998499	1.222031	1.000000	3.699007
0.00	0.6	4.090797	13.926126	6.467918	1.339322	1.086805	3.699765
0.00	0.7	4.853106	15.800662	7.663303	1.526647	1.136413	3.699914
0.00	0.8	5.097106	16.449694	8.060998	1.874080	1.146899	3.701344
0.00	0.9	5.275031	16.720821	8.279064	2.784491	1.175776	3.726982
0.01	0.0	0.889304	9.338449	1.885963	1.000969	0.508421	5.338851
0.01	0.1	1.181749	10.590751	2.491118	1.018208	0.595797	5.339490
0.01	0.2	1.601752	12.335798	3.347225	1.046788	0.693508	5.341010
0.01	0.3	2.255277	15.005401	4.668075	1.087348	0.803071	5.343205
0.01	0.4	3.333210	19.362832	6.835335	1.143767	0.920247	5.345773
0.01	0.5	5.183678	26.805068	10.546348	1.223479	1.034259	5.348209
0.01	0.6	8.241318	39.107408	16.679546	1.341062	1.127391	5.349793
0.01	0.7	11.986433	54.306559	24.224229	1.528907	1.180864	5.350104
0.01	0.8	13.705927	61.541413	27.750910	1.877487	1.192191	5.353095
0.01	0.9	14.526145	64.197828	29.223377	2.792021	1.223425	5.406887
0.02	0.0	0.916116	11.018277	2.097956	1.002228	0.516651	6.213843
0.02	0.1	1.228358	12.573722	2.794843	1.019510	0.607131	6.214710
0.02	0.2	1.685374	14.779802	3.798935	1.048165	0.708912	6.216769
0.02	0.3	2.417575	18.252847	5.393601	1.088833	0.823800	6.219743
0.02	0.4	3.684775	24.200015	8.138822	1.145410	0.947569	6.223223
0.02	0.5	6.052020	35.254113	13.254265	1.225360	1.068898	6.226524
0.02	0.6	10.607316	56.533758	23.099826	1.343321	1.168673	6.228671
0.02	0.7	17.689741	89.861364	38.463402	1.531845	1.226234	6.229093
0.02	0.8	21.812855	109.78439	47.526290	1.881920	1.238453	6.233148
0.02	0.9	23.572517	116.84799	51.046529	2.801834	1.272192	6.306202
0.05	0.0	0.952091	14.782170	2.463825	1.006952	0.541432	8.406271
0.05	0.1	1.291568	16.924294	3.316558	1.024398	0.641641	8.407857
0.05	0.2	1.800292	20.019934	4.571471	1.053333	0.756415	8.411626
0.05	0.3	2.646601	25.067883	6.638377	1.094411	0.888652	8.417072
0.05	0.4	4.209827	34.281989	10.433599	1.151584	1.034399	8.423447
0.05	0.5	7.519796	53.686887	18.447936	1.232429	1.180700	8.429495
0.05	0.6	15.859705	102.59877	38.644982	1.351822	1.303639	8.433431
0.05	0.7	39.079406	239.59474	95.045339	1.542908	1.375672	8.434204
0.05	0.8	68.851488	417.82229	167.88826	1.898645	1.391069	8.441641
0.05	0.9	82.797400	495.25509	200.73801	2.839069	1.433779	8.576192
0.10	0.0	0.971551	19.869238	2.773995	1.017205	0.584266	11.948858
0.10	0.1	1.325446	22.544450	3.746950	1.035011	0.702692	11.952063
0.10	0.2	1.860840	26.408260	5.185219	1.064557	0.842731	11.959681
0.10	0.3	2.765941	32.775586	7.585849	1.106533	1.010210	11.970692
0.10	0.4	4.487301	44.704382	12.117263	1.165014	1.202879	11.983590
0.10	0.5	8.362366	71.378019	22.283976	1.247822	1.405385	11.995836
0.10	0.6	19.813906	150.23955	52.335361	1.370365	1.583087	12.003808
0.10	0.7	75.609034	536.92334	199.21983	1.567111	1.690586	12.005375
0.10	0.8	540.08947	3787.9241	1428.0497	1.935427	1.713898	12.020448

Q1	Q2	N VAR($\hat{\mu}$)	N VAR($\hat{\sigma}$)	N VAR($\hat{\tau}$) / EXP(2μ−8)	N COV($\hat{\mu}$, $\hat{\sigma}$)	N COV($\hat{\mu}$, $\hat{\tau}$) / EXP(μ−4)	N COV($\hat{\sigma}$, $\hat{\tau}$) / EXP(μ−4)
0.00	0.0	4.015152	2.060608	0.827274	-0.030304	-0.111959	0.223919
0.00	0.1	4.091516	2.424300	0.830610	0.134569	-0.096219	0.258743
0.00	0.2	4.255492	2.861590	0.834228	0.401882	-0.071924	0.298517
0.00	0.3	4.554600	3.422938	0.838487	0.811235	-0.036291	0.347407
0.00	0.4	5.090952	4.178529	0.843716	1.447365	0.016596	0.410260
0.00	0.5	6.079645	5.254124	0.850419	2.477933	0.097897	0.495163
0.00	0.6	8.025234	6.905653	0.859489	4.269366	0.230531	0.617525
0.00	0.7	12.331795	9.746593	0.872746	7.764863	0.469002	0.811528
0.00	0.8	24.191903	15.687904	0.894783	16.152327	0.978630	1.173093
0.00	0.9	78.241470	34.877748	0.942970	48.316045	2.580748	2.132378
0.01	0.0	4.214417	2.587046	19.696570	-0.352750	-2.036080	3.301319
0.01	0.1	4.254732	3.144779	20.397153	-0.206331	-1.872792	3.926267
0.01	0.2	4.367371	3.844368	21.183865	0.073526	-1.576366	4.668071
0.01	0.3	4.607252	4.791560	22.153035	0.549449	-1.095368	5.626098
0.01	0.4	5.097602	6.152365	23.412547	1.365438	-0.310978	6.935128
0.01	0.5	6.126614	8.255096	25.148672	2.835131	1.023280	8.845486
0.01	0.6	8.465396	11.852013	27.738004	5.733298	3.479588	11.896600
0.01	0.7	14.663260	19.058555	32.095821	12.411349	8.664920	17.498423
0.01	0.8	36.871341	38.279034	41.223199	33.053883	22.855777	30.733298
0.01	0.9	208.68444	142.33940	74.231077	166.61531	97.687475	89.216941
0.02	0.0	4.332557	2.807065	38.013137	-0.513932	-3.505939	5.304855
0.02	0.1	4.359389	3.456637	39.797928	-0.386932	-3.296789	6.381326
0.02	0.2	4.448881	4.284758	41.827713	-0.115845	-2.872971	7.677695
0.02	0.3	4.657093	5.429276	44.370447	0.371341	-2.147542	9.383453
0.02	0.4	5.112406	7.115947	47.744882	1.246523	-0.910807	11.768853
0.02	0.5	6.129487	9.808393	52.524255	2.899656	1.289503	15.355472
0.02	0.6	8.600994	14.620511	59.923096	6.345242	5.556817	21.320879
0.02	0.7	15.716029	24.901344	73.091180	14.890612	15.212275	32.951222
0.02	0.8	44.613630	55.497021	103.51321	44.597795	44.759019	63.434806
0.02	0.9	343.90604	273.79291	245.22267	299.92546	249.41451	238.94306
0.05	0.0	4.673637	3.316628	118.29087	-0.930522	-8.724988	11.661725
0.05	0.1	4.679376	4.203784	126.70234	-0.875463	-8.558704	14.392725
0.05	0.2	4.720120	5.376500	136.55198	-0.659355	-7.933917	17.790985
0.05	0.3	4.850354	7.073618	149.36917	-0.191160	-6.649218	22.454357
0.05	0.4	5.200681	9.722999	167.21632	0.770007	-4.157878	29.329658
0.05	0.5	16.132521	14.281779	194.14986	2.827748	0.837008	40.408205
0.05	0.6	8.836394	23.321970	239.75342	7.765394	11.909761	60.706382
0.05	0.7	18.509544	45.968385	333.17349	22.549173	41.876142	106.67955
0.05	0.8	74.018607	136.57600	615.57130	93.390074	166.56902	266.49072
0.05	0.9	1689.5180	1854.2510	3883.3175	1757.6989	2451.8213	2631.1850
0.10	0.0	5.320614	4.059563	377.17265	-1.623340	-21.628369	25.439673
0.10	0.1	5.334682	5.356380	416.16023	-1.743869	-22.297094	32.548149
0.10	0.2	5.336669	7.160202	463.78029	-1.706974	-22.111550	41.815007
0.10	0.3	5.369733	9.946280	529.22447	-1.410643	-20.681001	55.316087
0.10	0.4	5.539794	14.673882	627.01619	-0.520768	-16.644112	76.813755
0.10	0.5	6.217687	23.776403	789.58411	1.953580	-6.210807	115.27194
0.10	0.6	9.008836	45.048380	1107.6571	9.639324	23.439865	197.49727
0.10	0.7	24.044058	115.23938	1943.6777	42.063357	135.03520	439.59450
0.10	0.8	204.29975	640.49046	6468.2685	349.31982	1033.7169	1979.6251

B. $\sigma = 2$

Q1	Q2	N VAR($\hat{\sigma}\|\mu$)	N VAR($\hat{\tau}\|\mu$) / EXP($2\mu-8$)	N COV($\hat{\sigma},\hat{\tau}\|\mu$) / EXP($\mu-4$)	N VAR($\hat{\mu}\|\sigma,\tau$)	N VAR($\hat{\sigma}\|\mu,\tau$)	N VAR($\hat{\tau}\|\mu,\sigma$) / EXP($2\mu-8$)
0.00	0.0	2.060379	0.824152	0.223074	4.000000	2.000000	0.800000
0.00	0.1	2.419874	0.828347	0.261907	4.068818	2.337064	0.800000
0.00	0.2	2.823637	0.833012	0.305309	4.182913	2.711737	0.800000
0.00	0.3	3.278446	0.838197	0.353871	4.344818	3.129048	0.800001
0.00	0.4	3.767041	0.843662	0.405542	4.570005	3.572100	0.800003
0.00	0.5	4.244172	0.848843	0.455262	4.888124	4.000000	0.800008
0.00	0.6	4.634382	0.852867	0.494884	5.357289	4.347220	0.800020
0.00	0.7	4.857354	0.854909	0.516215	6.106587	4.545650	0.800049
0.00	0.8	4.903400	0.855195	0.519686	7.496319	4.587597	0.800116
0.00	0.9	5.041394	0.857845	0.538702	11.137966	4.703105	0.800282
0.01	0.0	2.557520	18.712894	3.130898	4.003878	2.033682	14.880071
0.01	0.1	3.134774	19.572812	3.835447	4.072830	2.383187	14.880079
0.01	0.2	3.843130	20.614889	4.694609	4.187153	2.774031	14.880149
0.01	0.3	4.726034	21.892612	5.756729	4.349393	3.212285	14.880406
0.01	0.4	5.786621	23.393576	7.018426	4.575067	3.680987	14.881130
0.01	0.5	6.943120	24.977762	8.371956	4.893916	4.137038	14.882926
0.01	0.6	7.969063	26.307766	9.540004	5.364247	4.509564	14.887141
0.01	0.7	8.553280	26.975484	10.164219	6.115629	4.723456	14.896919
0.01	0.8	8.647370	27.055378	10.243883	7.509949	4.768765	14.920228
0.01	0.9	9.312407	28.502499	11.222486	11.168083	4.893700	14.978156
0.02	0.0	2.746102	35.176104	4.888977	4.008911	2.066603	26.472094
0.02	0.1	3.422294	37.304731	6.088709	4.078039	2.428522	26.472121
0.02	0.2	4.281741	39.972423	7.602885	4.192659	2.835648	26.472341
0.02	0.3	5.399667	43.380144	9.554690	4.355334	3.295199	26.473155
0.02	0.4	6.812016	47.582616	11.990929	4.581641	3.790274	26.475446
0.02	0.5	8.436662	52.252974	14.745451	4.901438	4.275592	26.481132
0.02	0.6	9.939413	56.333021	17.221429	5.373286	4.674693	26.494478
0.02	0.7	10.792797	58.366512	18.537907	6.127381	4.904935	26.525464
0.02	0.8	10.915056	58.608332	18.691674	7.527678	4.953810	26.599457
0.02	0.9	12.223550	64.337223	21.425035	11.207335	5.088767	26.784130
0.05	0.0	3.131361	102.00261	9.924579	4.027807	2.165726	70.547514
0.05	0.1	4.039994	111.04825	12.791479	4.097594	2.566563	70.547706
0.05	0.2	5.284395	123.21609	16.682693	4.213331	3.025662	70.549269
0.05	0.3	7.066084	140.25394	22.192302	4.377646	3.554609	70.555049
0.05	0.4	9.608993	163.89214	29.945268	4.606338	4.137595	70.571326
0.05	0.5	12.977885	194.03562	40.022255	4.929714	4.722798	70.611744
0.05	0.6	16.497768	223.70135	50.240124	5.407287	5.214555	70.706714
0.05	0.7	18.497952	238.43257	55.664123	6.171634	5.502687	70.927836
0.05	0.8	18.744742	240.72990	56.328789	7.594580	5.564275	71.459367
0.05	0.9	25.619683	325.24493	80.419863	11.356275	5.735117	72.807989
0.10	0.0	3.564276	289.25304	18.840774	4.068818	2.337064	189.66066
0.10	0.1	4.786322	322.96623	25.259388	4.140045	2.810769	189.66205
0.10	0.2	6.614213	372.16498	34.742459	4.258228	3.370924	189.67334
0.10	0.3	9.575701	449.57362	49.883136	4.426133	4.040841	189.71513
0.10	0.4	14.624927	577.00955	75.249126	4.660054	4.811518	189.83286
0.10	0.5	23.162594	783.38018	117.22335	4.991288	5.621539	190.12560
0.10	0.6	34.734443	1046.6695	172.41695	5.481458	6.332349	190.81568
0.10	0.7	41.652553	1185.2989	203.36010	6.268444	6.762342	192.43470
0.10	0.8	43.209581	1237.8624	212.13494	7.741710	6.855594	196.39815

B, σ = 2

Q1	Q2	N VAR($\hat{\mu}\mid\tau$)	N VAR($\hat{\sigma}\mid\tau$)	N COV($\hat{\mu},\hat{\sigma}\mid\tau$)	N VAR($\hat{\mu}\mid\sigma$)	N VAR($\hat{\tau}\mid\sigma$) / EXP($2\mu-8$)	N COV($\hat{\mu},\hat{\tau}\mid\sigma$) / EXP($\mu-4$)
0.00	0.0	4.000000	2.000000	0.000000	4.014706	0.802941	-0.108666
0.00	0.1	4.080370	2.343700	0.164542	4.084046	0.802994	-0.110582
0.00	0.2	4.249291	2.754769	0.427619	4.199052	0.803087	-0.113847
0.00	0.3	4.553029	3.278998	0.826272	4.362338	0.803227	-0.118627
0.00	0.4	5.090625	3.979038	1.439295	4.589612	0.803435	-0.125511
0.00	0.5	6.068376	4.965812	2.420932	4.911011	0.803754	-0.135630
0.00	0.6	7.963401	6.461974	4.103734	5.385732	0.804268	-0.151249
0.00	0.7	12.079760	8.991990	7.328760	6.145726	0.805176	-0.177522
0.00	0.8	23.121569	14.149937	14.869308	7.561405	0.807063	-0.229191
0.00	0.9	71.178397	30.055711	42.480088	11.309390	0.812599	-0.373228
0.01	0.0	4.003943	2.033715	-0.011485	4.166319	15.483768	-1.585937
0.01	0.1	4.082779	2.389009	0.154165	4.241194	15.495197	-1.615188
0.01	0.2	4.250068	2.815713	0.420893	4.365965	15.515604	-1.665646
0.01	0.3	4.553091	3.362728	0.827634	4.544246	15.547049	-1.740514
0.01	0.4	5.093471	4.098082	1.457554	4.794560	15.595067	-1.850139
0.01	0.5	6.084977	5.143893	2.475215	5.152916	15.670572	-2.014615
0.01	0.6	8.028899	6.749660	4.240931	5.691968	15.796649	-2.275278
0.01	0.7	12.323989	9.518534	7.687294	6.580718	16.029818	-2.730437
0.01	0.8	24.199191	15.366315	16.014123	8.329367	16.548189	-3.682374
0.01	0.9	80.128543	35.111225	49.206567	13.652963	18.310771	-6.745374
0.02	0.0	4.009206	2.066755	-0.024667	4.238464	27.987902	-2.534700
0.02	0.1	4.086289	2.433435	0.141686	4.316076	28.017309	-2.582470
0.02	0.2	4.251548	2.875477	0.411504	4.445748	28.070344	-2.665393
0.02	0.3	4.553151	3.444866	0.825502	4.631695	28.152966	-2.789332
0.02	0.4	5.095031	4.214989	1.471032	4.894049	28.280726	-2.972395
0.02	0.5	6.097829	5.319219	2.522670	5.272261	28.484587	-3.250036
0.02	0.6	8.085697	7.034457	4.368105	5.847185	28.831168	-3.696358
0.02	0.7	12.549938	10.046158	8.032561	6.811677	29.487789	-4.492037
0.02	0.8	25.259871	16.623002	17.168643	8.774530	31.005275	-6.217635
0.02	0.9	90.228035	40.968656	56.897908	15.353767	36.693585	-12.334807
0.05	0.0	4.030092	2.166955	-0.070367	4.412567	77.286626	-5.453144
0.05	0.1	4.101239	2.568846	0.096761	4.497056	77.425190	-5.561334
0.05	0.2	4.259145	3.058562	0.374333	4.639259	77.681135	-5.752093
0.05	0.3	4.554362	3.698101	0.808404	4.845188	78.090495	-6.042405
0.05	0.4	5.097294	4.578592	1.499296	5.139701	78.742707	-6.480621
0.05	0.5	6.128913	5.871662	2.653543	5.572636	79.820759	-7.163692
0.05	0.6	8.244776	7.950908	4.749802	6.250792	81.736547	-8.303324
0.05	0.7	13.246187	11.810424	9.140759	7.448351	85.600577	-10.454077
0.05	0.8	28.946268	21.207888	21.279667	10.158883	95.587561	-15.656165
0.05	0.9	141.50457	71.462275	96.440102	23.343612	149.66189	-42.356199
0.10	0.0	4.080370	2.343700	-0.164542	4.671473	217.75232	-11.455542
0.10	0.1	4.140045	2.810769	0.000000	4.766933	218.38077	-11.700437
0.10	0.2	4.282462	3.390109	0.286630	4.929731	219.58398	-12.142955
0.10	0.3	4.561563	4.164481	0.750996	5.169667	221.58489	-12.835734
0.10	0.4	5.097977	5.263674	1.518249	5.521312	224.91722	-13.918034
0.10	0.5	6.168833	6.947773	2.860300	6.057171	230.72669	-15.682085
0.10	0.6	8.512809	9.834259	5.459954	6.946241	241.80640	-18.820038
0.10	0.7	14.662614	15.817898	11.522939	8.690574	266.79158	-25.420542
0.10	0.8	39.097786	34.622654	32.948908	13.782729	349.65177	-45.959254

Table F3

COEFFICIENTS IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS c, θ, AND K OF WEIBULL POPULATION FROM SAMPLES OF SIZE n WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

A. K=1

Q1	Q2	$\frac{V(\hat{\theta})}{\theta^2/N}$	$\frac{V(\hat{K})}{1/N}$	$\frac{V(\hat{c})}{\theta^2/N}$	$\frac{C(\hat{\theta},\hat{K})}{\theta/N}$	$\frac{C(\hat{\theta},\hat{c})}{\theta^2/N}$	$\frac{C(\hat{K},\hat{c})}{\theta/N}$	$\frac{V(\hat{K}\|\theta)}{1/N}$	$\frac{V(\hat{c}\|\theta)}{\theta^2/N}$	$\frac{C(\hat{K},\hat{c}\|\theta)}{\theta/N}$
.005	.00	1.143	0.678	0.006	0.306	-0.014	-0.020	0.596	0.005	-0.016
.010	.00	1.173	0.725	0.012	0.343	-0.028	-0.037	0.624	0.011	-0.029
.015	.00	1.202	0.766	0.019	0.378	-0.042	-0.054	0.647	0.018	-0.041
.020	.00	1.231	0.805	0.027	0.411	-0.057	-0.072	0.667	0.025	-0.053
.025	.00	1.260	0.842	0.036	0.445	-0.073	-0.090	0.685	0.032	-0.064
.005	.25	1.342	1.196	0.006	-0.002	-0.007	-0.032	1.196	0.006	-0.032
.010	.25	1.352	1.317	0.013	0.033	-0.015	-0.061	1.316	0.013	-0.061
.015	.25	1.364	1.427	0.021	0.069	-0.025	-0.091	1.424	0.021	-0.090
.020	.25	1.377	1.532	0.031	0.106	-0.036	-0.123	1.524	0.030	-0.120
.025	.25	1.392	1.635	0.041	0.146	-0.049	-0.156	1.620	0.040	-0.151
.005	.50	2.554	2.157	0.006	-1.073	0.016	-0.052	1.706	0.006	-0.045
.010	.50	2.569	2.471	0.015	-1.143	0.027	-0.103	1.963	0.014	-0.091
.015	.50	2.579	2.766	0.025	-1.196	0.037	-0.157	2.211	0.024	-0.140
.020	.50	2.585	3.057	0.037	-1.239	0.045	-0.216	2.463	0.036	-0.194
.025	.50	2.589	3.350	0.050	-1.273	0.053	-0.280	2.724	0.049	-0.254
.005	.75	12.501	5.496	0.007	-6.803	0.118	-0.112	1.794	0.006	-0.048
.010	.75	13.780	6.880	0.019	-8.133	0.238	-0.236	2.080	0.015	-0.096
.015	.75	14.946	8.295	0.034	-9.417	0.371	-0.383	2.362	0.025	-0.150
.020	.75	16.080	9.806	0.054	-10.726	0.521	-0.556	2.651	0.037	-0.209
.025	.75	17.218	11.449	0.079	-12.093	0.690	-0.759	2.955	0.051	-0.275

Q1	Q2	$\frac{V(\hat{\theta}\|K)}{\theta^2/N}$	$\frac{V(\hat{c}\|K)}{\theta^2/N}$	$\frac{C(\hat{\theta},\hat{c}\|K)}{\theta^2/N}$	$\frac{V(\hat{\theta}\|c)}{\theta^2/N}$	$\frac{V(\hat{K}\|c)}{1/N}$	$\frac{C(\hat{\theta},\hat{K}\|c)}{\theta/N}$	$\frac{V(\hat{\theta}\|K,c)}{\theta^2/N}$	$\frac{V(\hat{K}\|\theta,c)}{1/N}$	$\frac{V(\hat{c}\|\theta,K)}{\theta^2/N}$
.000	.00				1.109	0.608	0.257	1.000	0.548	
.005	.00	1.005	0.005	-0.005	1.109	0.610	0.258	1.000	0.550	0.005
.010	.00	1.010	0.010	-0.010	1.109	0.612	0.259	1.000	0.551	0.010
.015	.00	1.015	0.015	-0.015	1.110	0.614	0.260	1.000	0.553	0.015
.020	.00	1.020	0.021	-0.021	1.110	0.616	0.260	1.000	0.555	0.020
.025	.00	1.026	0.026	-0.026	1.111	0.618	0.261	1.000	0.556	0.026
.000	.25				1.335	1.020	-0.037	1.333	1.019	
.005	.25	1.342	0.005	-0.007	1.335	1.025	-0.038	1.333	1.024	0.005
.010	.25	1.351	0.010	-0.014	1.335	1.031	-0.038	1.333	1.030	0.010
.015	.25	1.361	0.016	-0.021	1.335	1.036	-0.038	1.333	1.035	0.015
.020	.25	1.370	0.021	-0.028	1.335	1.042	-0.038	1.333	1.041	0.020
.025	.25	1.379	0.027	-0.035	1.335	1.048	-0.038	1.333	1.047	0.026
.000	.50				2.510	1.716	-0.936	2.000	1.367	
.005	.50	2.020	0.005	-0.010	2.515	1.731	-0.944	2.000	1.377	0.005
.010	.50	2.041	0.010	-0.021	2.519	1.747	-0.952	2.000	1.387	0.010
.015	.50	2.062	0.016	-0.031	2.524	1.763	-0.961	2.000	1.397	0.015
.020	.50	2.083	0.021	-0.042	2.529	1.780	-0.970	2.000	1.408	0.020
.025	.50	2.105	0.027	-0.053	2.534	1.797	-0.979	2.000	1.418	0.026
.000	.75				10.498	3.736	-4.927	4.000	1.423	
.005	.75	4.082	0.005	-0.020	10.623	3.807	-5.022	4.000	1.434	0.005
.010	.75	4.167	0.011	-0.042	10.754	3.883	-5.121	4.000	1.444	0.010
.015	.75	4.255	0.016	-0.064	10.892	3.963	-5.226	4.000	1.456	0.015
.020	.75	4.348	0.022	-0.088	11.036	4.047	-5.336	4.000	1.467	0.020
.025	.75	4.444	0.028	-0.113	11.187	4.136	-5.452	4.000	1.479	0.026

B. K=2

Q1	Q2	$V(\hat{\theta})/\theta^2/N$	$V(\hat{K})/1/N$	$V(\hat{c})/\theta^2/N$	$C(\hat{\theta},\hat{K})/\theta/N$	$C(\hat{\theta},\hat{c})/\theta^2/N$	$C(\hat{K},\hat{c})/\theta/N$	$V(\hat{K}\|\theta)/1/N$	$V(\hat{c}\|\theta)/\theta^2/N$	$C(\hat{K},\hat{c}\|\theta)/\theta/N$
.005	.00	0.886	5.897	0.434	1.709	-0.514	-1.225	2.602	0.136	-0.234
.010	.00	1.064	6.765	0.567	2.102	-0.668	-1.565	2.613	0.148	-0.246
.015	.00	1.214	7.459	0.681	2.424	-0.799	-1.846	2.618	0.156	-0.251
.020	.00	1.351	8.072	0.787	2.714	-0.919	-2.101	2.619	0.162	-0.254
.025	.00	1.481	8.639	0.888	2.986	-1.034	-2.340	2.620	0.166	-0.256
.005	.25	0.916	11.535	0.544	2.042	-0.563	-2.011	6.980	0.198	-0.756
.010	.25	1.133	13.758	0.746	2.738	-0.773	-2.682	7.144	0.220	-0.815
.015	.25	1.330	15.628	0.929	3.344	-0.962	-3.265	7.219	0.233	-0.847
.020	.25	1.520	17.347	1.105	3.916	-1.145	-3.816	7.259	0.243	-0.866
.025	.25	1.710	18.992	1.281	4.474	-1.327	-4.354	7.282	0.250	-0.880
.005	.50	0.969	22.484	0.691	1.358	-0.485	-3.279	20.581	0.448	-2.600
.010	.50	1.156	27.993	1.002	2.371	-0.726	-4.588	23.128	0.546	-3.099
.015	.50	1.344	32.883	1.300	3.332	-0.963	-5.795	24.626	0.610	-3.409
.020	.50	1.543	37.580	1.603	4.298	-1.209	-6.989	25.609	0.657	-3.622
.025	.50	1.756	42.248	1.918	5.295	-1.468	-8.201	26.283	0.692	-3.776
.005	.75	2.736	63.723	1.059	-6.992	0.291	-7.167	45.853	1.028	-6.422
.010	.75	2.736	86.664	1.716	-6.967	0.287	-11.048	68.923	1.686	-10.318
.015	.75	2.743	109.409	2.429	-6.593	0.220	-15.076	93.562	2.412	-14.547
.020	.75	2.762	133.401	3.234	-5.921	0.097	-19.469	120.707	3.230	-19.261
.025	.75	2.799	159.352	4.151	-4.948	-0.086	-24.349	150.605	4.149	-24.501

Q1	Q2	$V(\hat{\theta}\|K)/\theta^2/N$	$V(\hat{c}\|K)/\theta^2/N$	$C(\hat{\theta},\hat{c}\|K)/\theta^2/N$	$V(\hat{\theta}\|c)/\theta^2/N$	$V(\hat{K}\|c)/1/N$	$C(\hat{\theta},\hat{K}\|c)/\theta/N$	$V(\hat{\theta}\|K,c)/\theta^2/N$	$V(\hat{K}\|\theta,c)/1/N$	$V(\hat{c}\|\theta,K)/\theta^2/N$
.000	.00				0.277	2.432	0.257	0.250	2.193	
.005	.00	0.391	0.179	-0.159	0.277	2.439	0.258	0.250	2.199	0.115
.010	.00	0.411	0.205	-0.182	0.277	2.447	0.259	0.250	2.206	0.125
.015	.00	0.426	0.224	-0.199	0.277	2.455	0.260	0.250	2.212	0.132
.020	.00	0.438	0.240	-0.213	0.278	2.463	0.260	0.250	2.219	0.137
.025	.00	0.449	0.254	-0.225	0.278	2.471	0.261	0.250	2.226	0.141
.000	.25				0.334	4.080	-0.037	0.333	4.075	
.005	.25	0.554	0.193	-0.207	0.334	4.101	-0.038	0.333	4.097	0.116
.010	.25	0.588	0.224	-0.239	0.334	4.123	-0.038	0.333	4.119	0.127
.015	.25	0.614	0.246	-0.263	0.334	4.145	-0.038	0.333	4.141	0.134
.020	.25	0.636	0.266	-0.284	0.334	4.169	-0.038	0.333	4.164	0.139
.025	.25	0.655	0.283	-0.302	0.334	4.192	-0.038	0.333	4.188	0.144
.000	.50				0.628	6.865	-0.936	0.500	5.469	
.005	.50	0.887	0.213	-0.287	0.629	6.925	-0.944	0.500	5.508	0.120
.010	.50	0.955	0.250	-0.337	0.630	6.987	-0.952	0.500	5.547	0.131
.015	.50	1.007	0.279	-0.376	0.631	7.052	-0.961	0.500	5.588	0.138
.020	.50	1.052	0.304	-0.409	0.632	7.119	-0.970	0.500	5.630	0.144
.025	.50	1.093	0.326	-0.440	0.633	7.187	-0.979	0.500	5.674	0.149
.000	.75				2.624	14.942	-4.927	1.000	5.693	
.005	.75	1.969	0.253	-0.495	2.656	15.230	-5.022	1.000	5.735	0.129
.010	.75	2.176	0.308	-0.601	2.688	15.534	-5.121	1.000	5.778	0.141
.015	.75	2.346	0.352	-0.688	2.723	15.853	-5.226	1.000	5.822	0.150
.020	.75	2.499	0.392	-0.767	2.759	16.190	-5.336	1.000	5.868	0.157
.025	.75	2.645	0.431	-0.842	2.797	16.544	-5.452	1.000	5.915	0.163

C. K=3

Q1	Q2	$V(\hat{\theta})/\theta^2/N$	$V(\hat{K})/1/N$	$V(\hat{c})/\theta^2/N$	$C(\hat{\theta},\hat{K})/\theta/N$	$C(\hat{\theta},\hat{c})/\theta^2/N$	$C(\hat{K},\hat{c})/\theta/N$	$V(\hat{K}\|\theta)/1/N$	$V(\hat{c}\|\theta)/\theta^2/N$	$C(\hat{K},\hat{c}\|\theta)/\theta/N$
.000	.00	1.361	19.832	1.072	4.474	-1.152	-3.924	5.130	0.097	-0.138
.005	.00	2.340	30.383	1.931	7.686	-2.069	-6.933	5.134	0.102	-0.137
.010	.00	2.735	34.326	2.283	8.934	-2.442	-8.111	5.139	0.103	-0.135
.015	.00	3.064	37.522	2.578	9.960	-2.753	-9.082	5.146	0.104	-0.132
.020	.00	3.364	40.367	2.847	10.884	-3.038	-9.957	5.154	0.104	-0.130
.025	.00	3.648	43.007	3.103	11.749	-3.307	-10.779	5.163	0.105	-0.128
.000	.25	1.503	35.308	1.317	5.913	-1.336	-5.867	12.052	0.130	-0.612
.005	.25	2.981	61.075	2.752	12.082	-2.792	-11.944	12.112	0.137	-0.629
.010	.25	3.660	71.795	3.409	14.779	-3.460	-14.599	12.115	0.138	-0.627
.015	.25	4.258	80.907	3.989	17.115	-4.049	-16.899	12.125	0.139	-0.625
.020	.25	4.828	89.336	4.541	19.305	-4.610	-19.055	12.140	0.139	-0.622
.025	.25	5.387	97.425	5.083	21.432	-5.160	-21.149	12.160	0.140	-0.619
.000	.50	1.528	60.538	1.581	6.570	-1.406	-8.444	32.294	0.289	-2.402
.005	.50	3.429	119.035	3.890	17.108	-3.500	-20.060	33.689	0.317	-2.598
.010	.50	4.447	146.176	5.084	22.364	-4.603	-25.754	33.715	0.320	-2.607
.015	.50	5.410	170.457	6.199	27.198	-5.639	-30.956	33.716	0.321	-2.607
.020	.50	6.376	193.877	7.308	31.955	-6.674	-36.052	33.726	0.322	-2.604
.025	.50	7.370	217.202	8.441	36.771	-7.735	-41.194	33.751	0.322	-2.601
.000	.75	1.768	133.333	2.061	2.815	-1.113	-14.335	128.849	1.360	-12.562
.005	.75	3.625	334.411	6.921	22.065	-4.113	-45.576	200.095	2.254	-20.539
.010	.75	5.069	449.338	10.083	34.945	-6.250	-64.640	208.423	2.377	-21.552
.015	.75	6.684	563.786	13.398	48.539	-8.564	-84.118	211.287	2.426	-21.927
.020	.75	8.539	684.737	17.038	63.516	-11.162	-105.098	212.260	2.447	-22.069
.025	.75	10.684	815.705	21.102	80.279	-14.115	-128.169	212.509	2.455	-22.114

Q1	Q2	$V(\hat{\theta}\|K)/\theta^2/N$	$V(\hat{c}\|K)/\theta^2/N$	$C(\hat{\theta},\hat{c}\|K)/\theta^2/N$	$V(\hat{\theta}\|c)/\theta^2/N$	$V(\hat{K}\|c)/1/N$	$C(\hat{\theta},\hat{K}\|c)/\theta/N$	$V(\hat{\theta}\|K,c)/\theta^2/N$	$V(\hat{K}\|\theta,c)/1/N$	$V(\hat{c}\|\theta,K)/\theta^2/N$
.000	.00	0.352	0.296	-0.267	0.123	5.471	0.257	0.111	4.935	0.093
.005	.00	0.395	0.349	-0.315	0.123	5.488	0.258	0.111	4.949	0.098
.010	.00	0.409	0.366	-0.330	0.123	5.506	0.259	0.111	4.963	0.099
.015	.00	0.420	0.379	-0.343	0.123	5.524	0.260	0.111	4.977	0.100
.020	.00	0.430	0.391	-0.353	0.123	5.542	0.260	0.111	4.992	0.101
.025	.00	0.438	0.401	-0.362	0.123	5.561	0.261	0.111	5.007	0.102
.000	.25	0.513	0.342	-0.354	0.148	9.179	-0.037	0.148	9.170	0.099
.005	.25	0.591	0.416	-0.429	0.148	9.227	-0.038	0.148	9.217	0.104
.010	.25	0.618	0.440	-0.455	0.148	9.276	-0.038	0.148	9.267	0.106
.015	.25	0.638	0.460	-0.475	0.148	9.327	-0.038	0.148	9.317	0.107
.020	.25	0.656	0.477	-0.492	0.148	9.379	-0.038	0.148	9.369	0.108
.025	.25	0.672	0.492	-0.508	0.148	9.433	-0.038	0.148	9.423	0.108
.000	.50	0.815	0.403	-0.489	0.279	15.446	-0.936	0.222	12.306	0.110
.005	.50	0.971	0.509	-0.617	0.279	15.581	-0.944	0.222	12.392	0.117
.010	.50	1.026	0.547	-0.663	0.280	15.722	-0.952	0.222	12.481	0.118
.015	.50	1.070	0.577	-0.699	0.280	15.867	-0.961	0.222	12.573	0.120
.020	.50	1.109	0.604	-0.732	0.281	16.017	-0.970	0.222	12.668	0.121
.025	.50	1.145	0.628	-0.762	0.282	16.172	-0.979	0.222	12.766	0.122
.000	.75	1.708	0.520	-0.810	1.166	33.620	-4.927	0.444	12.810	0.135
.005	.75	2.169	0.709	-1.106	1.180	34.267	-5.022	0.444	12.903	0.145
.010	.75	2.351	0.784	-1.223	1.195	34.951	-5.121	0.444	13.000	0.148
.015	.75	2.505	0.848	-1.322	1.210	35.670	-5.226	0.444	13.100	0.150
.020	.75	2.647	0.906	-1.413	1.226	36.427	-5.336	0.444	13.203	0.152
.025	.75	2.783	0.963	-1.501	1.243	37.223	-5.452	0.444	13.309	0.154

Table F4

COEFFICIENTS IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS c, θ, AND α OF GAMMA POPULATION FROM SAMPLES OF SIZE n WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

A. α=1

Q1	Q2	$V(\hat{\theta})/\theta^2/N$	$V(\hat{\alpha})/1/N$	$V(\hat{c})/\theta^2/N$	$C(\hat{\theta},\hat{\alpha})/\theta/N$	$C(\hat{\theta},\hat{c})/\theta^2/N$	$C(\hat{\alpha},\hat{c})/\theta/N$	$V(\hat{\alpha}\|\theta)/1/N$	$V(\hat{c}\|\theta)/\theta^2/N$	$C(\hat{\alpha},\hat{c}\|\theta)/\theta/N$
.005	.00	2.812	1.896	0.006	-1.851	0.039	-0.045	0.678	0.006	-0.019
.010	.00	2.970	2.131	0.014	-2.044	0.074	-0.088	0.725	0.012	-0.037
.015	.00	3.105	2.344	0.023	-2.213	0.109	-0.131	0.766	0.019	-0.054
.020	.00	3.228	2.546	0.033	-2.371	0.144	-0.177	0.805	0.027	-0.071
.025	.00	3.343	2.744	0.045	-2.522	0.181	-0.225	0.842	0.035	-0.089
.005	.25	4.956	2.556	0.006	-3.039	0.063	-0.058	0.692	0.006	-0.020
.010	.25	5.360	2.941	0.015	-3.433	0.120	-0.115	0.741	0.012	-0.038
.015	.25	5.714	3.297	0.025	-3.788	0.180	-0.175	0.785	0.019	-0.055
.020	.25	6.045	3.643	0.037	-4.127	0.243	-0.239	0.826	0.027	-0.073
.025	.25	6.363	3.989	0.050	-4.459	0.308	-0.307	0.865	0.035	-0.091
.005	.50	10.389	3.808	0.007	-5.645	0.110	-0.081	0.741	0.006	-0.021
.010	.50	11.625	4.540	0.016	-6.596	0.218	-0.164	0.797	0.012	-0.040
.015	.50	12.751	5.242	0.028	-7.485	0.334	-0.256	0.848	0.019	-0.060
.020	.50	13.839	5.946	0.043	-8.361	0.459	-0.357	0.895	0.027	-0.079
.025	.50	14.918	6.669	0.060	-9.244	0.595	-0.468	0.941	0.036	-0.099
.005	.75	35.945	7.938	0.008	-15.904	0.277	-0.148	0.901	0.006	-0.026
.010	.75	43.463	10.290	0.020	-20.109	0.584	-0.320	0.986	0.013	-0.050
.015	.75	50.925	12.746	0.038	-24.390	0.946	-0.528	1.065	0.020	-0.075
.020	.75	58.722	15.415	0.061	-28.952	1.372	-0.777	1.141	0.029	-0.101
.025	.75	67.055	18.365	0.091	-33.910	1.872	-1.075	1.217	0.039	-0.128

Q1	Q2	$V(\hat{\theta}\|\alpha)/\theta^2/N$	$V(\hat{c}\|\alpha)/\theta^2/N$	$C(\hat{\theta},\hat{c}\|\alpha)/\theta^2/N$	$V(\hat{\theta}\|c)/\theta^2/N$	$V(\hat{\alpha}\|c)/1/N$	$C(\hat{\theta},\hat{\alpha}\|c)/\theta/N$	$V(\hat{\theta}\|\alpha,c)/\theta^2/N$	$V(\hat{\alpha}\|\theta,c)/1/N$	$V(\hat{c}\|\theta,\alpha)/\theta^2/N$
.000	.00				2.551	1.551	-1.551	1.000	0.608	
.005	.00	1.005	0.005	-0.005	2.563	1.563	-1.563	1.000	0.610	0.005
.010	.00	1.010	0.010	-0.010	2.575	1.575	-1.575	1.000	0.612	0.010
.015	.00	1.015	0.015	-0.015	2.587	1.587	-1.587	1.000	0.614	0.015
.020	.00	1.020	0.021	-0.021	2.600	1.600	-1.600	1.000	0.615	0.020
.025	.00	1.026	0.026	-0.026	2.612	1.613	-1.612	1.000	0.617	0.026
.000	.25				4.314	2.005	-2.445	1.333	0.620	
.005	.25	1.342	0.005	-0.007	4.344	2.025	-2.469	1.333	0.622	0.005
.010	.25	1.351	0.010	-0.014	4.375	2.046	-2.494	1.333	0.623	0.010
.015	.25	1.361	0.016	-0.021	4.406	2.067	-2.520	1.333	0.625	0.015
.020	.25	1.370	0.021	-0.028	4.437	2.088	-2.546	1.333	0.627	0.020
.025	.25	1.379	0.027	-0.035	4.469	2.110	-2.572	1.333	0.629	0.026
.000	.50				8.513	2.801	-4.271	2.000	0.658	
.005	.50	2.020	0.005	-0.010	8.605	2.840	-4.331	2.000	0.660	0.005
.010	.50	2.041	0.010	-0.021	8.699	2.881	-4.393	2.000	0.662	0.010
.015	.50	2.062	0.016	-0.031	8.795	2.922	-4.456	2.000	0.665	0.015
.020	.50	2.083	0.021	-0.042	8.893	2.965	-4.521	2.000	0.667	0.020
.025	.50	2.105	0.027	-0.053	8.993	3.009	-4.587	2.000	0.669	0.026
.000	.75				25.685	5.021	-10.435	4.000	0.782	
.005	.75	4.082	0.005	-0.020	26.241	5.150	-10.702	4.000	0.785	0.005
.010	.75	4.167	0.011	-0.042	26.820	5.284	-10.981	4.000	0.788	0.010
.015	.75	4.255	0.016	-0.064	27.424	5.425	-11.273	4.000	0.791	0.015
.020	.75	4.000	0.794	0.020	28.054	5.572	-11.577	4.000	0.794	0.020
.025	.75	4.444	0.028	-0.113	28.713	5.726	-11.895	4.000	0.798	0.026

B. $\alpha=2$

Q1	Q2	$\frac{V(\hat{\theta})}{\theta^2/N}$	$\frac{V(\hat{\alpha})}{1/N}$	$\frac{V(\hat{c})}{\theta^2/N}$	$\frac{C(\hat{\theta},\hat{\alpha})}{\theta/N}$	$\frac{C(\hat{\theta},\hat{c})}{\theta^2/N}$	$\frac{C(\hat{\alpha},\hat{c})}{\theta/N}$	$\frac{V(\hat{\alpha}\mid\theta)}{1/N}$	$\frac{V(\hat{c}\mid\theta)}{\theta^2/N}$	$\frac{C(\hat{\alpha},\hat{c}\mid\theta)}{\theta/N}$
.005	.00	3.637	18.996	1.226	-7.580	1.309	-3.841	3.196	0.755	-1.113
.010	.00	4.000	22.592	1.710	-8.722	1.728	-5.161	3.569	0.964	-1.393
.015	.00	4.286	25.571	2.149	-9.646	2.082	-6.305	3.861	1.138	-1.618
.020	.00	4.536	28.272	2.574	-10.468	2.408	-7.376	4.115	1.295	-1.818
.025	.00	4.765	30.820	2.996	-11.231	2.719	-8.413	4.346	1.445	-2.004
.005	.25	6.743	28.967	1.446	-13.141	2.134	-5.324	3.355	0.771	-1.164
.010	.25	7.687	35.606	2.096	-15.645	2.917	-7.400	3.764	0.989	-1.463
.015	.25	8.467	41.334	2.710	-17.759	3.609	-9.275	4.087	1.171	-1.705
.020	.25	9.175	46.702	3.323	-19.708	4.268	-11.089	4.369	1.338	-1.922
.025	.25	9.843	51.911	3.951	-21.573	4.915	-12.898	4.627	1.496	-2.124
.005	.50	14.483	48.691	1.788	-25.492	3.755	-7.916	3.824	0.814	-1.306
.010	.50	17.245	62.453	2.725	-31.657	5.364	-11.507	4.342	1.057	-1.660
.015	.50	19.652	74.952	3.661	-37.141	6.865	-14.927	4.757	1.263	-1.953
.020	.50	21.930	87.162	4.640	-42.415	8.358	-18.384	5.127	1.454	-2.219
.025	.50	24.165	99.456	5.680	-47.657	9.883	-21.960	5.470	1.638	-2.470
.005	.75	50.409	118.410	2.668	-75.497	9.356	-15.741	5.339	0.931	-1.728
.010	.75	65.498	166.105	4.525	-102.323	14.648	-25.150	6.254	1.249	-2.267
.015	.75	80.141	214.395	6.609	-128.914	20.171	-35.182	7.026	1.532	-2.734
.020	.75	95.331	266.111	9.013	-156.941	26.213	-46.330	7.741	1.805	-3.176
.025	.75	111.532	322.739	11.803	-187.230	32.936	-58.899	8.432	2.077	-3.609

Q1	Q2	$\frac{V(\hat{\theta}\mid\alpha)}{\theta^2/N}$	$\frac{V(\hat{c}\mid\alpha)}{\theta^2/N}$	$\frac{C(\hat{\theta},\hat{c}\mid\alpha)}{\theta^2/N}$	$\frac{V(\hat{\theta}\mid c)}{\theta^2/N}$	$\frac{V(\hat{\alpha}\mid c)}{1/N}$	$\frac{C(\hat{\theta},\hat{\alpha}\mid c)}{\theta/N}$	$\frac{V(\hat{\theta}\mid\alpha,c)}{\theta^2/N}$	$\frac{V(\hat{\alpha}\mid\theta,c)}{1/N}$	$\frac{V(\hat{c}\mid\theta,\alpha)}{\theta^2/N}$
.000	.00				2.225	6.900	-3.450	0.500	1.551	
.005	.00	0.612	0.449	-0.224	2.239	6.959	-3.479	0.500	1.554	0.367
.010	.00	0.632	0.531	-0.265	2.254	7.018	-3.508	0.500	1.557	0.420
.015	.00	0.647	0.595	-0.296	2.268	7.078	-3.538	0.500	1.560	0.460
.020	.00	0.660	0.650	-0.323	2.283	7.138	-3.567	0.500	1.563	0.492
.025	.00	0.672	0.700	-0.347	2.297	7.199	-3.597	0.500	1.567	0.521
.000	.25				3.561	9.269	-5.227	0.614	1.594	
.005	.25	0.781	0.468	-0.281	3.594	9.375	-5.287	0.614	1.597	0.367
.010	.25	0.813	0.558	-0.334	3.627	9.482	-5.347	0.614	1.601	0.421
.015	.25	0.837	0.629	-0.376	3.661	9.589	-5.406	0.614	1.604	0.460
.020	.25	0.858	0.690	-0.412	3.694	9.698	-5.467	0.614	1.608	0.492
.025	.25	0.877	0.747	-0.445	3.728	9.808	-5.528	0.614	1.611	0.521
.000	.50				6.500	13.417	-8.718	0.836	1.725	
.005	.50	1.138	0.501	-0.389	6.593	13.639	-8.861	0.836	1.729	0.368
.010	.50	1.199	0.605	-0.469	6.686	13.862	-9.005	0.836	1.733	0.422
.015	.50	1.247	0.688	-0.532	6.780	14.089	-9.151	0.836	1.737	0.461
.020	.50	1.290	0.762	-0.588	6.874	14.312	-9.299	0.836	1.741	0.494
.025	.50	1.329	0.831	-0.640	6.970	14.554	-9.449	0.836	1.745	0.523
.000	.75				17.124	24.788	-19.698	1.470	2.128	
.005	.75	2.273	0.576	-0.680	17.599	25.546	-20.298	1.470	2.134	0.372
.010	.75	2.466	0.717	-0.845	18.082	26.320	-20.910	1.470	2.140	0.427
.015	.75	2.626	0.836	-0.983	18.578	27.120	-21.540	1.470	2.146	0.468
.020	.75	2.773	0.947	-1.111	19.091	27.950	-22.193	1.470	2.153	0.502
.025	.75	2.914	1.054	-1.233	19.624	28.814	-22.871	1.470	2.159	0.532

C. $\alpha=3$

Q1	Q2	$V(\hat{\theta})/\theta^2/N$	$V(\hat{\alpha})/1/N$	$V(\hat{c})/\theta^2/N$	$C(\hat{\theta},\hat{\alpha})/\theta/N$	$C(\hat{\theta},\hat{c})/\theta^2/N$	$C(\hat{\alpha},\hat{c})/\theta/N$	$V(\hat{\alpha}\|\theta)/1/N$	$V(\hat{c}\|\theta)/\theta^2/N$	$C(\hat{\alpha},\hat{c}\|\theta)/\theta/N$
.000	.00	3.635	50.165	4.635	-12.541	2.635	-12.541	6.900	2.725	-3.450
.005	.00	5.022	84.475	10.073	-19.437	5.376	-26.191	9.247	4.318	-5.383
.010	.00	5.517	97.990	12.554	-22.024	6.485	-31.981	10.073	4.933	-6.096
.015	.00	5.911	109.157	14.721	-24.121	7.408	-36.901	10.727	5.436	-6.669
.020	.00	6.256	119.241	16.761	-25.987	8.248	-41.435	11.298	5.888	-7.177
.025	.00	6.573	128.710	18.741	-27.719	9.039	-45.766	11.819	6.310	-7.646
.000	.25	6.376	73.928	5.328	-20.605	4.008	-16.594	7.336	2.809	-3.641
.005	.25	9.865	138.790	13.140	-35.646	9.219	-39.087	9.990	4.523	-5.774
.010	.25	11.249	166.799	17.040	-41.871	11.542	-49.538	10.942	5.196	-6.574
.015	.25	12.402	190.929	20.590	-47.146	13.566	-58.794	11.702	5.751	-7.224
.020	.25	13.452	213.467	24.043	-52.012	15.470	-67.615	12.370	6.253	-7.802
.025	.25	14.447	235.264	27.494	-56.668	17.323	-76.288	12.985	6.723	-8.340
.000	.50	12.355	115.244	6.203	-36.316	6.288	-22.598	8.501	3.003	-4.116
.005	.50	21.756	246.979	17.975	-71.499	16.789	-61.947	12.001	5.019	-6.772
.010	.50	25.920	310.255	24.544	-87.732	22.018	-82.334	13.310	5.840	-7.809
.015	.50	29.573	367.583	30.845	-102.203	26.816	-101.340	14.376	6.530	-8.666
.020	.50	33.044	423.385	37.241	-116.121	31.528	-120.232	15.328	7.161	-9.442
.025	.50	36.458	479.369	43.880	-129.944	36.288	-139.509	16.216	7.761	-10.172
.000	.75	34.127	230.795	7.847	-86.430	12.237	-36.352	11.901	3.459	-5.362
.005	.75	76.378	638.600	31.199	-217.665	43.580	-133.842	18.288	6.333	-9.645
.010	.75	99.404	879.632	47.419	-292.163	62.903	-196.364	20.925	7.614	-11.483
.015	.75	121.867	1122.696	64.835	-366.053	82.681	-261.425	23.178	8.740	-13.075
.020	.75	145.232	1381.914	84.276	-443.877	103.993	-332.414	25.278	9.812	-14.576
.025	.75	170.198	1664.652	106.274	-527.894	127.428	-411.278	27.313	10.869	-16.042

Q1	Q2	$V(\hat{\theta}\|\alpha)/\theta^2/N$	$V(\hat{c}\|\alpha)/\theta^2/N$	$C(\hat{\theta},\hat{c}\|\alpha)/\theta^2/N$	$V(\hat{\theta}\|c)/\theta^2/N$	$V(\hat{\alpha}\|c)/1/N$	$C(\hat{\theta},\hat{\alpha}\|c)/\theta/N$	$V(\hat{\theta}\|\alpha,c)/\theta^2/N$	$V(\hat{\alpha}\|\theta,c)/1/N$	$V(\hat{c}\|\theta,\alpha)/\theta^2/N$
.000	.00	0.500	1.500	-0.500	2.137	16.234	-5.411	0.333	2.532	1.000
.005	.00	0.550	1.953	-0.650	2.153	16.376	-5.458	0.333	2.536	1.184
.010	.00	0.567	2.116	-0.703	2.168	16.519	-5.505	0.333	2.540	1.244
.015	.00	0.581	2.247	-0.746	2.183	16.661	-5.551	0.333	2.544	1.290
.020	.00	0.593	2.362	-0.783	2.198	16.805	-5.598	0.333	2.549	1.328
.025	.00	0.604	2.468	-0.817	2.213	16.950	-5.644	0.333	2.553	1.363
.000	.25	0.633	1.604	-0.617	3.361	22.251	-8.124	0.395	2.616	1.002
.005	.25	0.710	2.132	-0.819	3.396	22.516	-8.220	0.395	2.620	1.186
.010	.25	0.738	2.327	-0.893	3.430	22.781	-8.315	0.395	2.624	1.246
.015	.25	0.760	2.485	-0.952	3.464	23.046	-8.410	0.395	2.629	1.292
.020	.25	0.780	2.626	-1.005	3.498	23.314	-8.506	0.395	2.634	1.331
.025	.25	0.797	2.756	-1.053	3.533	23.585	-8.602	0.395	2.638	1.366
.000	.50	0.911	1.771	-0.833	5.981	32.914	-13.408	0.519	2.858	1.010
.005	.50	1.057	2.437	-1.145	6.075	33.489	-13.640	0.519	2.863	1.198
.010	.50	1.112	2.695	-1.264	6.168	34.061	-13.870	0.519	2.869	1.259
.015	.50	1.157	2.907	-1.361	6.260	34.638	-14.102	0.519	2.874	1.306
.020	.50	1.196	3.098	-1.448	6.354	35.223	-14.336	0.520	2.880	1.345
.025	.50	1.233	3.279	-1.530	6.449	35.817	-14.573	0.520	2.886	1.381
.000	.75	1.760	2.121	-1.377	15.045	62.390	-29.743	0.866	3.591	1.044
.005	.75	2.187	3.148	-2.039	15.503	64.428	-30.709	0.866	3.599	1.246
.010	.75	2.365	3.584	-2.317	15.960	66.480	-31.677	0.866	3.608	1.313
.015	.75	2.516	3.961	-2.556	16.428	68.586	-32.669	0.866	3.616	1.364
.020	.75	2.657	4.315	-2.780	16.909	70.762	-33.693	0.866	3.625	1.407
.025	.75	2.793	4.662	-2.997	17.406	73.021	-34.753	0.866	3.634	1.446

TABLE F5

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

ARRANGEMENT OF TABULAR VALUES FOR EACH COMBINATION OF Q1, Q2, B, AND P

$N\,VAR(\hat{A})/A^2$	$N\,COV(\hat{A},\hat{B})/A$ $N\,VAR(\hat{B})$	$N\,COV(\hat{A},\hat{P})/A$ $N\,COV(\hat{B},\hat{P})$ $N\,VAR(\hat{P})$	$N\,COV(\hat{A},\hat{C})/A^2$ $N\,COV(\hat{B},\hat{C})/A$ $N\,COV(\hat{P},\hat{C})/A$ $N\,VAR(\hat{C})/A^2$
	$N\,VAR(\hat{B}\mid A)$	$N\,COV(\hat{B},\hat{P}\mid A)$ $N\,VAR(\hat{P}\mid A)$	$N\,COV(\hat{B},\hat{C}\mid A)/A$ $N\,COV(\hat{P},\hat{C}\mid A)/A$ $N\,VAR(\hat{C}\mid A)/A^2$
$N\,VAR(\hat{A}\mid B)/A^2$		$N\,COV(\hat{A},\hat{P}\mid B)/A$ $N\,VAR(\hat{P}\mid B)$	$N\,COV(\hat{A},\hat{C}\mid B)/A^2$ $N\,COV(\hat{P},\hat{C}\mid B)/A$ $N\,VAR(\hat{C}\mid B)/A^2$
		$N\,VAR(\hat{P}\mid A,B)$	$N\,COV(\hat{P},\hat{C}\mid A,B)/A$ $N\,VAR(\hat{C}\mid A,B)/A^2$
$N\,VAR(\hat{A}\mid P)/A^2$	$N\,COV(\hat{A},\hat{B}\mid P)/A$ $N\,VAR(\hat{B}\mid P)$		$N\,COV(\hat{A},\hat{C}\mid P)/A^2$ $N\,COV(\hat{B},\hat{C}\mid P)/A$ $N\,VAR(\hat{C}\mid P)/A^2$
	$N\,VAR(\hat{B}\mid A,P)$		$N\,COV(\hat{B},\hat{C}\mid A,P)/A$ $N\,VAR(\hat{C}\mid A,P)/A^2$
$N\,VAR(\hat{A}\mid B,P)/A^2$			$N\,COV(\hat{A},\hat{C}\mid B,P)/A^2$ $N\,VAR(\hat{C}\mid B,P)/A^2$
			$N\,VAR(\hat{C}\mid A,B,P)/A^2$
$N\,VAR(\hat{A}\mid C)/A^2$	$N\,COV(\hat{A},\hat{B}\mid C)/A$ $N\,VAR(\hat{B}\mid C)$	$N\,COV(\hat{A},\hat{P}\mid C)/A$ $N\,COV(\hat{B},\hat{P}\mid C)$ $N\,VAR(\hat{P}\mid C)$	
	$N\,VAR(\hat{B}\mid A,C)$	$N\,COV(\hat{B},\hat{P}\mid A,C)$ $N\,VAR(\hat{P}\mid A,C)$	
$N\,VAR(\hat{A}\mid B,C)/A^2$		$N\,COV(\hat{A},\hat{P}\mid B,C)/A$ $N\,VAR(\hat{P}\mid B,C)$	
$N\,VAR(\hat{A}\mid P,C)/A^2$	$N\,COV(\hat{A},\hat{B}\mid P,C)/A$ $N\,VAR(\hat{B}\mid P,C)$		
		$N\,VAR(\hat{P}\mid A,B,C)$	
	$N\,VAR(\hat{B}\mid A,P,C)$		
$N\,VAR(\hat{A}\mid B,P,C)/A^2$			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.00, B= 1.0, P= 3.0

5.30772	-14.91938	23.83349	0.99266
	56.40271	-73.18953	-8.10825
		114.80484	6.59776
			2.23764
	14.46606	-6.19634	-5.31798
		7.78419	2.14035
			2.05199
1.36131		4.47374	-1.15209
		19.83232	-3.92370
			1.07203
		5.13007	-0.13753
			0.09701
0.35988	0.27477		-0.37703
	9.74346		-3.90209
			1.85847
	9.53367		-3.61422
			1.46348
0.35213			-0.26699
			0.29575
			0.09332
4.86735	-11.32239	20.90658	
	27.02194	-49.28210	
		95.35112	
	0.68388	-0.64937	
		5.55167	
0.12318		0.25702	
		5.47134	
0.28339	-0.51685		
	1.55055		
		4.93507	
	0.60793		
0.11111			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.25, B= 1.0, P= 3.0

15.83389	-47.06445	86.01908	2.99543
	154.56908	-263.08530	-14.22536
		483.09374	18.34561
			2.62649
	14.67531	-7.40327	-5.32178
		15.78706	2.07266
			2.05982
1.50332		5.91273	-1.33602
		35.30774	-5.86675
			1.31729
		12.05232	-0.61203
			0.12995
0.51744	-0.21981		-0.27117
	11.29695		-4.23463
			1.92981
	11.20357		-4.34982
			1.78770
0.51316			-0.35356
			0.34247
			0.09887
12.41769	-30.84085	65.09646	
	77.52285	-163.72331	
		354.95243	
	0.92583	-2.04830	
		13.70147	
0.14830		-0.03745	
		9.17929	
0.47933	-0.81484		
	2.00479		
		9.16983	
	0.61962		
0.14815			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.50, B= 1.0, P= 3.0

41.12282	-126.21918	260.59192	6.16242
	402.35990	-809.76856	-24.12518
		1690.2355	40.10863
			3.02793
	14.95258	-9.92801	-5.21072
		38.88593	1.05787
			2.10447
1.52821		6.56978	-1.40558
		60.53751	-8.44444
			1.58141
		32.29407	-2.40187
			0.28862
0.94608	-1.37318		-0.02132
	14.41093		-4.90968
			2.07617
	12.41785		-4.94063
			2.07569
0.81523			-0.48915
			0.40348
			0.10998
28.58111	-77.11984	178.96321	
	210.14161	-490.20148	
		1158.9483	
	2.05071	-7.30870	
		38.35416	
0.27892		-0.93577	
		15.44564	
0.94586	-1.42360		
	2.80062		
		12.30612	
	0.65798		
0.22222			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.75, B= 1.0, P= 3.0

167.61974	-556.33170	1321.7328	15.72070
	1866.1491	-4424.1539	-56.46661
		10621.850	119.53270
			3.76942
	19.67819	-37.30866	-4.28945
		199.58410	-4.42978
			2.29501
1.76752		2.81506	-1.11299
		133.33256	-14.33493
			2.06083
		128.84913	-12.56232
			1.35999
3.14957	-5.81094		0.84661
	23.42515		-6.67951
			2.42426
	12.70401		-5.11752
			2.19669
1.70808			-0.81033
			0.51964
			0.13521
102.05514	-320.83255	823.21073	
	1020.2681	-2633.5303	
		6831.3256	
	11.66105	-45.58809	
		191.03381	
1.16643		-4.92678	
		33.62011	
2.85391	-3.47828		
	5.02121		
		12.81027	
	0.78196		
0.44444			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.00, B= 1.0, P= 3.0

5.72085	-19.67542	27.21345	2.46706
	114.50116	-113.63800	-26.39740
		143.16407	19.26492
			8.01681
	46.83252	-20.04421	-17.91256
		13.71271	7.52938
			6.95291
2.33990		7.68635	-2.06896
		30.38272	-6.93349
			1.93108
		5.13383	-0.13716
			0.10169
0.54796	1.92554		-1.19492
	24.29979		-11.10566
			5.42442
	17.53340		-6.90668
			2.81868
0.39538			-0.31490
			0.34883
			0.09803
4.96165	-11.55198	21.28494	
	27.58096	-50.20332	
		96.86921	
	0.68497	-0.64653	
		5.55908	
0.12322		0.25782	
		5.48829	
0.28474	-0.52088		
	1.56265		
		4.94884	
	0.60978		
0.11111			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.25, B= 1.0, P= 3.0

22.03570	-81.91270	126.80781	10.54663
	352.13191	-493.19193	-57.34093
		751.83392	68.36676
			12.08898
	47.64010	-21.81279	-18.13622
		22.09905	7.67454
			7.04120
2.98122		12.08181	-2.79198
		61.07494	-11.94429
			2.75162
		12.11171	-0.62942
			0.13688
0.64771	1.27134		-0.98442
	28.60530		-12.49334
			5.87217
	26.10986		-10.56108
			4.37599
0.59120			-0.42916
			0.41571
			0.10417
12.83464	-31.88750	67.16348	
	80.15023	-168.91210	
		365.19976	
	0.92612	-2.04524	
		13.73419	
0.14830		-0.03763	
		9.22702	
0.48268	-0.82307		
	2.02505		
		9.21747	
	0.62155		
0.14815			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.50, B= 1.0, P= 3.0

74.13352	-270.38363	482.31044	28.30015
	1033.9862	-1779.0033	-121.60949
		3179.8620	189.17232
			18.19258
	47.82891	-19.89547	-18.39170
		41.96474	5.05238
			7.38912
3.42918		17.10755	-3.50029
		119.03523	-20.06033
			3.88981
		33.68879	-2.59804
			0.31694
0.97834	-0.55059		-0.39285
	38.70633		-15.77528
			6.93858
	38.39647		-15.99636
			6.78083
0.97051			-0.61725
			0.50916
			0.11658
30.11015	-81.20943	188.03633	
	221.07968	-514.46858	
		1212.7872	
	2.05153	-7.31997	
		38.51012	
0.27941		-0.94395	
		15.58110	
0.95610	-1.44375		
	2.84029		
		12.39208	
	0.66016		
0.22222			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.75, B= 1.0, P= 3.0

464.45386	-1685.6060	3572.1833	115.53391
	6165.5549	-12985.508	-437.64060
		27683.681	876.15508
			37.98509
	48.11708	-21.26343	-18.34242
		209.49185	-12.43331
			9.24578
3.62468		22.06472	-4.11300
		334.41117	-45.57634
			6.92069
		200.09533	-20.53902
			2.25358
3.51468	-10.01181		2.47863
	74.47819		-26.66494
			10.25585
	45.95884		-19.60441
			8.50787
2.16883			-1.10584
			0.70917
			0.14533
113.05064	-354.49627	907.30583	
	1123.3326	-2890.9955	
		7474.4988	
	11.72810	-45.92949	
		192.77210	
1.18030		-5.02154	
		34.26736	
2.91565	-3.56745		
	5.15000		
		12.90344	
	0.78504		
0.44444			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.00, B= 1.0, P= 3.0

5.76855	-20.82940	27.88245	2.87516
	143.01341	-130.09736	-36.50430
		152.67371	25.09663
			11.60038
	67.80150	-29.41791	-26.12251
		17.90315	11.19946
			10.16734
2.73482		8.93423	-2.44156
		34.32590	-8.11083
			2.28263
		5.13922	-0.13465
			0.10288
0.67644	2.92999		-1.70818
	32.15396		-15.11879
			7.47498
	19.46287		-7.71989
			3.16143
0.40945			-0.33050
			0.36613
			0.09935
5.05594	-11.78179	21.66224	
	28.14099	-51.12280	
		98.37886	
	0.68607	-0.64362	
		5.56679	
0.12326		0.25865	
		5.50575	
0.28609	-0.52495		
	1.57490		
		4.96299	
	0.61165		
0.11111			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.25, B= 1.0, P= 3.0

24.23725	-97.35808	142.90671	14.43154
	460.62815	-606.20932	-84.64960
		869.59623	96.80368
			18.96529
	69.55263	-32.17054	-26.67987
		26.99551	11.71303
			10.37235
3.65971		14.77868	-3.45995
		71.79492	-14.59936
			3.40924
		12.11550	-0.62735
			0.13815
0.75241	2.26445		-1.47687
	38.03002		-17.16622
			8.18908
	31.21500		-12.72146
			5.29021
0.61758			-0.45473
			0.44049
			0.10567
13.25565	-32.94443	69.24446	
	82.80357	-174.13626	
		375.48564	
	0.92639	-2.04217	
		13.76852	
0.14830		-0.03781	
		9.27632	
0.48607	-0.83142		
	2.04565		
		9.26668	
	0.62349		
0.14815			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.50, B= 1.0, P= 3.0

90.02715	-349.13174	593.51817	42.65192
	1424.3199	-2330.0831	-192.78160
		3958.0216	289.62294
			31.17712
	70.36193	-28.37696	-27.37439
		45.15940	8.43342
			10.97003
4.44737		22.36421	-4.60304
		146.17634	-25.75364
			5.08414
		33.71497	-2.60667
			0.32000
1.02717	0.27177		-0.77798
	52.60251		-22.28089
			9.98435
	52.53061		-22.07505
			9.39511
1.02577			-0.66286
			0.54681
			0.11846
31.67710	-85.39648	197.29891	
	232.26793	-539.21923	
		1267.5405	
	2.05246	-7.33238	
		38.67605	
0.27992		-0.95240	
		15.72167	
0.96655	-1.46435		
	2.88089		
		12.48119	
	0.66235		
0.22222			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.75, B= 1.0, P= 3.0

672.08085	-2523.2162	5145.2249	206.65343
	9544.9859	-19331.498	-805.38460
		39601.496	1566.5089
			78.03959
	71.98871	-14.60319	-29.53853
		211.38554	-15.56020
			14.49718
5.06886		34.94517	-6.24992
		449.33808	-64.63966
			10.08304
		208.42323	-21.55221
			2.37688
3.58744	-11.57115		3.12474
	108.30211		-40.69218
			16.07350
	70.97988		-30.61348
			13.35178
2.35117			-1.22287
			0.78428
			0.14825
124.85043	-390.51049	997.01721	
	1233.2520	-3164.8046	
		8156.5579	
	11.80289	-46.30767	
		194.68436	
1.19489		-5.12137	
		34.95067	
2.97999	-3.66046		
	5.28446		
		13.00009	
	0.78814		
0.44444			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.00, B= 1.0, P= 3.0

5.78272	-21.42437	28.19780	3.09559
	168.85390	-143.73564	-46.09763
		159.87557	30.15859
			15.16236
	89.47888	-39.26580	-34.62878
		22.37704	15.06381
			13.50523
3.06437		9.96046	-2.75332
		37.52165	-9.08168
			2.57756
		5.14612	-0.13225
			0.10372
0.80938	3.92677		-2.22358
	39.62881		-18.98364
			9.47330
	20.57776		-8.19577
			3.36455
0.42028			-0.34251
			0.37945
			0.10032
5.15072	-12.01294	22.04053	
	28.70476	-52.04545	
		99.88881	
	0.68717	-0.64066	
		5.57478	
0.12330		0.25952	
		5.52368	
0.28746	-0.52908		
	1.58733		
		4.97748	
	0.61354		
0.11111			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.25, B= 1.0, P= 3.0

25.92587	-110.59929	156.00110	17.95754
	564.54447	-708.93450	-112.33232
		971.16150	124.16420
			26.34118
	92.73004	-43.43679	-35.72581
		32.47212	16.11015
			13.90290
4.25849		17.11452	-4.04936
		80.90724	-16.89866
			3.98944
		12.12537	-0.62460
			0.13893
0.86687	3.27937		-1.98740
	47.03207		-21.69417
			10.46663
	34.62621		-14.17584
			5.91029
0.63821			-0.47474
			0.45991
			0.10676
13.68370	-34.01910	71.35479	
	85.50168	-179.43449	
		385.88965	
	0.92666	-2.03909	
		13.80430	
0.14830		-0.03797	
		9.32705	
0.48950	-0.83991		
	2.06660		
		9.31733	
	0.62546		
0.14815			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.50, B= 1.0, P= 3.0

104.32135	-424.50875	695.80962	57.35586
	1821.9029	-2869.5431	-270.35894
		4690.0602	394.86663
			46.31818
	94.47429	-38.12582	-36.96408
		49.10200	12.31059
			14.78393
5.40956		27.19759	-5.63857
		170.45724	-30.95554
			6.19861
		33.71604	-2.60655
			0.32134
1.09218	1.21194		-1.22590
	66.21589		-28.76570
			13.07348
	64.87106		-27.40538
			11.69749
1.07000			-0.69940
			0.57700
			0.11983
33.29751	-89.72293	206.84576	
	243.81945	-564.70908	
		1323.7870	
	2.05349	-7.34582	
		38.85097	
0.28044		-0.96109	
		15.86701	
0.97723	-1.48541		
	2.92244		
		12.57324	
	0.66457		
0.22222			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.75, B= 1.0, P= 3.0

900.40032	-3472.8608	6877.0441	319.35746
	13495.065	-26534.642	-1274.2571
		52737.470	2421.3871
			133.71873
	100.17594	-9.75485	-42.48948
		212.23711	-17.78941
			20.44779
6.68381		48.53901	-8.56373
		563.78614	-84.11827
			13.39835
		211.28721	-21.92692
			2.42594
3.62358	-12.70416		3.60499
	144.26802		-55.94612
			22.54321
	99.72759		-43.30712
			18.95671
2.50486			-1.32159
			0.84770
			0.15041
137.68601	-429.58083	1094.0992	
	1352.1785	-3460.3134	
		8890.8390	
	11.88493	-46.72035	
		196.76047	
1.21019		-5.22629	
		35.67017	
3.04709	-3.75756		
	5.42496		
		13.09999	
	0.79128		
0.44444			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.00, B= 1.0, P= 3.0

5.78539	-21.66808	28.31813	3.18890
	193.91899	-156.02632	-55.72422
		165.90465	34.87819
			18.85986
	112.76533	-49.96613	-43.78078
		27.29398	19.26924
			17.10213
3.36425		10.88410	-3.03760
		40.36659	-9.95726
			2.84704
		5.15407	-0.12995
			0.10438
0.95179	4.96393		-2.76443
	47.18282		-22.92275
			11.52740
	21.29408		-8.50525
			3.49827
0.42955			-0.35281
			0.39088
			0.10111
5.24620	-12.24599	22.42078	
	29.27361	-52.97359	
		101.40321	
	0.68827	-0.63764	
		5.58302	
0.12335		0.26041	
		5.54206	
0.28884	-0.53325		
	1.59991		
		4.99229	
	0.61545		
0.11111			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.25, B= 1.0, P= 3.0

27.34448	-122.82826	167.59782	21.35266
	670.03358	-808.94120	-141.62719
		1065.9823	151.93332
			34.47742
	118.30312	-56.11100	-45.71348
		38.75370	21.06012
			17.80363
4.82802		19.30549	-4.60995
		89.33593	-19.05522
			4.54122
		12.14034	-0.62172
			0.13949
0.99411	4.35657		-2.53488
	56.15297		-26.32966
			12.82253
	37.06071		-15.22080
			6.35882
0.65611			-0.49212
			0.47677
			0.10765
14.12028	-35.11528	73.50202	
	88.25400	-184.82582	
		396.45036	
	0.92692	-2.03599	
		13.84144	
0.14830		-0.03812	
		9.37915	
0.49299	-0.84852		
	2.08790		
		9.36935	
	0.62744		
0.14815			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.50, B= 1.0, P= 3.0

118.11518	-501.07389	796.47598	73.05284
	2246.9711	-3428.3511	-357.51914
		5424.7372	509.43819
			64.19321
	121.29131	-49.50237	-47.61088
		53.92895	16.82725
			19.01090
6.37585		31.95469	-6.67383
		193.87728	-36.05220
			7.30777
		33.72565	-2.60409
			0.32204
1.17422	2.28676		-1.74439
	80.30557		-35.56199
			16.35176
	75.85217		-32.16485
			13.76035
1.10910			-0.73173
			0.60373
			0.12096
34.97995	-94.21173	216.72766	
	255.79569	-591.07423	
		1381.8288	
	2.05462	-7.36022	
		39.03453	
0.28097		-0.97002	
		16.01706	
0.98813	-1.50695		
	2.96498		
		12.66816	
	0.66680		
0.22222			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.75, B= 1.0, P= 3.0

1162.2615	-4589.6738	8866.5286	460.60808
	18258.374	-35019.634	-1876.7672
		67852.536	3494.5488
			209.94936
	134.13450	-6.45200	-57.86428
		212.57026	-19.28585
			27.40885
8.53851		63.51578	-11.16171
		684.73725	-105.09826
			17.03760
		212.25991	-22.06918
			2.44678
3.64116	-13.53555		3.96316
	184.25529		-73.18216
			29.97273
	133.93867		-58.44965
			25.65911
2.64683			-1.41287
			0.90638
			0.15220
151.73304	-472.23264	1199.8351	
	1481.6848	-3781.3657	
		9686.7434	
	11.97416	-47.16738	
		199.00004	
1.22622		-5.33647	
		36.42715	
3.11713	-3.85901		
	5.57190		
		13.20306	
	0.79445		
0.44445			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.00, B= 1.0, P= 3.0

5.78565	-21.63456	28.30335	3.17546
	218.92256	-167.51331	-65.59402
		171.18363	39.41193
			22.75602
	138.02342	-61.67729	-53.71986
		32.72400	23.87759
			21.01317
3.64766		11.74919	-3.30673
		43.00721	-10.77875
			3.10261
		5.16282	-0.12772
			0.10495
1.10600	6.06194		-3.34087
	55.00087		-27.02712
			13.68214
	21.77578		-8.71603
			3.59050
0.43789			-0.36207
			0.40117
			0.10179
5.34254	-12.48132	22.80365	
	29.84843	-53.90882	
		102.92478	
	0.68938	-0.63457	
		5.59151	
0.12339		0.26133	
		5.56086	
0.29024	-0.53747		
	1.61266		
		5.00740	
	0.61737		
0.11111			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.25, B= 1.0, P= 3.0

28.58330	-134.47492	178.24989	24.69657
	779.59296	-909.12068	-173.08989
		1157.5938	180.69986
			43.51342
	146.93317	-70.51419	-56.90073
		45.99976	26.68820
			22.17507
5.38721		21.43225	-5.16035
		97.42462	-21.14855
			5.08297
		12.15954	-0.61883
			0.13993
1.13583	5.51431		-3.12815
	65.61157		-31.17657
			15.30626
	38.84019		-15.98972
			6.69108
0.67238			-0.50793
			0.49213
			0.10843
14.56646	-36.23565	75.69149	
	91.06730	-190.32370	
		407.19459	
	0.92717	-2.03287	
		13.87991	
0.14830		-0.03825	
		9.43260	
0.49652	-0.85727		
	2.10956		
		9.42273	
	0.62943		
0.14815			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.50, B= 1.0, P= 3.0

131.82646	-580.71258	898.37604	90.04602
	2709.6051	-4020.2507	-456.24826
		6182.0618	635.74361
			85.26498
	151.49132	-62.78831	-59.58393
		59.77436	22.09455
			23.75771
7.37029		36.77075	-7.73543
		217.20183	-41.19353
			8.44106
		33.75061	-2.60109
			0.32241
1.27463	3.50948		-2.34012
	95.19982		-42.81845
			19.88712
	85.53709		-36.37533
			15.59085
1.14526			-0.76165
			0.62848
			0.12195
36.73132	-98.88123	226.98455	
	268.24554	-618.42120	
		1441.8984	
	2.05584	-7.37556	
		39.22654	
0.28151		-0.97918	
		16.17180	
0.99927	-1.52898		
	3.00854		
		12.76594	
	0.66906		
0.22222			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.75, B= 1.0, P= 3.0

1467.4759	-5920.3732	11189.848	637.71261
	24060.281	-45149.074	-2649.0134
		85537.862	4842.6998
			312.75552
	175.17423	-4.83902	-76.23069
		212.64289	-20.00854
			35.62841
10.68416		80.27854	-14.11469
		815.70521	-128.16912
			21.10174
		212.50922	-22.11434
			2.45504
3.64807	-14.08473		4.20279
	229.44338		-92.91243
			38.58757
	175.06411		-76.68602
			33.74571
2.78346			-1.50078
			0.96294
			0.15376

167.17156	-519.00023	1315.5201
	1623.3570	-4131.8083
		10553.604
	12.07070	-47.64938
		201.40630
1.24303		-5.45215
		37.22343
3.19032	-3.96511	
	5.72571	
		13.30930
	0.79765	
0.44445		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.00, B= 3.0, P= 1.0

407.99832	-795.03326	124.78596	42.27586
	1564.3831	-241.47613	-89.25062
		38.50881	12.23302
			8.52138
	15.16622	1.68417	-6.87107
		0.34312	-0.69702
			4.14085
3.95542		2.06567	-3.08209
		1.23487	-1.54359
			3.42948
		0.15610	0.06600
			1.02790
3.63534	-12.54134		2.63534
	50.16538		-12.54134
			4.63534
	6.89969		-3.44984
			2.72492
0.50000			-0.50000
			1.50000
			1.00000
198.26128	-352.24724	64.09606	
	629.59611	-113.35074	
		20.94747	
	3.76478	0.52758	
		0.22579	
1.18554		0.67844	
		0.54011	
2.13706	-5.41119		
	16.23357		
		0.15186	
	2.53207		
0.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.25, B= 3.0, P= 1.0

1187.3964	-2221.3827	389.30249	85.91169
	4174.9751	-725.44723	-169.21794
		128.32667	26.99814
			11.00843
	19.20958	2.86034	-8.49424
		0.68907	-1.16906
			4.79246
5.46336		3.31313	-4.12425
		2.27234	-2.40531
			4.14977
		0.26316	0.09575
			1.03641
6.37595	-20.60550		4.00787
	73.92826		-16.59395
			5.32839
	7.33632		-3.64148
			2.80907
0.63272			-0.61724
			1.60371
			1.00158
516.92654	-900.77628	178.60424	
	1573.8123	-310.44059	
		62.11378	
	4.15425	0.78828	
		0.40390	
1.36448		0.92262	
		0.87817	
3.36133	-8.12399		
	22.25058		
		0.25432	
	2.61576		
0.39516			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.50, B= 3.0, P= 1.0

2782.6920	-5074.2172	965.48655	147.74673
	9276.7484	-1755.7526	-279.84330
		336.48046	49.29972
			13.42574
	23.95298	4.80459	-10.42830
		1.49396	-1.96268
			5.58115
7.18504		5.12095	-5.32261
		4.18007	-3.66448
			4.98396
		0.53024	0.12907
			1.04103
12.35508	-36.31553		6.28764
	115.24437		-22.59771
			6.20255
	8.50143		-4.11633
			3.00270
0.91142			-0.83330
			1.77148
			1.00961
1156.7785	-1994.6159	422.95616	
	3443.7542	-728.15964	
		155.45041	
	4.46784	1.13735	
		0.80376	
1.50077		1.20748	
		1.48575	
5.98119	-13.40782		
	32.91432		
		0.51424	
	2.85846		
0.51944			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.75, B= 3.0, P= 1.0

9032.9065	-16092.419	3377.8045	310.38733
	28700.397	-6008.0480	-566.66826
		1267.9012	111.91455
			17.72557
	31.22549	9.62129	-13.70306
		4.79022	-4.15304
			7.06009
9.82763		9.06968	-7.34566
		10.19586	-6.70994
			6.53712
		1.82567	0.06919
			1.04661
34.12694	-86.43027		12.23674
	230.79509		-36.35247
			7.84715
	11.90083		-5.36156
			3.45947
1.75974			-1.37686
			2.12128
			1.04399
3597.8047	-6169.6565	1418.1015	
	10584.598	-2430.2554	
		561.30245	
	4.62896	1.56058	
		2.34723	
1.57343		1.52983	
		3.30853	
15.04512	-29.74269		
	62.38969		
		1.82110	
	3.59139		
0.86605			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.00, B= 3.0, P= 1.0

805.49100	-1659.2252	237.74639	139.77144
	3443.6377	-487.03164	-301.50421
		70.61279	39.91654
			32.63762
	25.81134	2.70047	-13.59001
		0.44025	-1.33799
			8.38402
6.03745		3.08315	-5.50034
		1.73219	-2.72502
			6.23972
		0.15772	0.08384
			1.22870
5.02202	-19.43704		5.37634
	84.47532		-26.19123
			10.07329
	9.24681		-5.38283
			4.31763
0.54972			-0.65004
			1.95281
			1.18413
206.91616	-368.02557	66.80277	
	658.36102	-118.28520	
		21.79396	
	3.78273	0.53166	
		0.22672	
1.18887		0.68103	
		0.54211	
2.15255	-5.45821		
	16.37637		
		0.15200	
	2.53599		
0.33334			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P.

Q1= 0.005, Q2= 0.25, B= 3.0, P= 1.0

3180.94618	-6248.3416	1004.0838	404.86738
	12310.535	-1967.1736	-814.22958
		317.93076	125.27704
			62.50366
	36.89952	5.15100	-18.94743
		0.98599	-2.52166
			10.97257
9.53455		5.62408	-8.40342
		3.58437	-4.83356
			8.64980
		0.26693	0.12331
			1.24331
9.86493	-35.64551		9.21946
	138.78951		-39.08694
			13.13965
	9.98962		-5.77375
			4.52342
0.71005			-0.81929
			2.13169
			1.18634
558.41797	-974.17006	192.60187	
	1703.6380	-335.20078	
		66.83606	
	4.18111	0.79660	
		0.40647	
1.37048		0.92820	
		0.88335	
3.39608	-8.22007		
	22.51632		
		0.25470	
	2.61995		
0.39516			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.50, B= 3.0, P= 1.0

9778.2393	-18641.248	3248.7264	970.41380
	35591.226	-6183.3789	-1877.0044
		1081.7651	317.53937
			111.18452
	53.52705	9.99739	-27.00630
		2.40685	-4.87133
			14.87854
14.70588		10.12211	-12.68537
		7.50670	-8.55868
			12.19536
		0.53961	0.17271
			1.25290
21.75587	-71.49929		16.78855
	246.97853		-61.94662
			17.97459
	12.00066		-6.77213
			5.01923
1.05712			-1.14475
			2.43728
			1.19763
1308.5087	-2258.8328	477.25626	
	3903.8515	-822.71546	
		174.88304	
	4.50744	1.15535	
		0.81194	
1.51082		1.21955	
		1.50024	
6.07511	-13.64020		
	33.48923		
		0.51580	
	2.86345		
0.51944			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.75, B= 3.0, P= 1.0

51806.595	-95887.793	18363.446	3696.0107
	177571.43	-33961.451	-6888.6653
		6518.7461	1296.5577
			289.08018
	94.62093	27.08494	-47.79284
		9.61051	-13.53601
			25.39763
27.60573		24.41092	-23.83846
		23.44338	-20.93510
			21.84287
		1.85753	0.14454
			1.25756
76.37785	-217.66509		43.58021
	638.60040		-133.84170
			31.19902
	18.28846		-9.64481
			6.33271
2.18733			-2.03934
			3.14767
			1.24631
4551.5559	-7813.3327	1786.4151	
	13417.278	-3064.9988	
		703.53654	
	4.68515	1.61310	
		2.39631	
1.58935		1.56316	
		3.37831	
15.50301	-30.70888		
	64.42846		
		1.84092	
	3.59928		
0.86607			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.00, B= 3.0, P= 1.0

967.05418	-2020.9891	282.85039	186.96801
	4253.6923	-588.02528	-407.19313
		83.20465	53.09188
			46.43144
	30.14735	3.08693	-16.45981
		0.47470	-1.59376
			10.28348
6.85384		3.47130	-6.49518
		1.91674	-3.19801
			7.45207
		0.15861	0.09164
			1.29678
5.51724	-22.02404		6.48461
	97.99012		-31.98134
			12.55416
	10.07323		-6.09570
			4.93257
0.56716			-0.70345
			2.11631
			1.24383
214.17995	-381.32232	69.06245	
	682.70142	-122.42165	
		22.49692	
	3.80166	0.53595	
		0.22769	
1.19267		0.68393	
		0.54433	
2.16774	-5.50470		
	16.51862		
		0.15214	
	2.54013		
0.33334			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.25, B= 3.0, P= 1.0

4186.4073	-8325.6152	1309.0521	596.00465
	16602.202	-2597.2314	-1209.1436
		410.43173	183.24849
			98.85619
	44.83831	6.11407	-23.85387
		1.10283	-3.11684
			14.00503
11.30642		6.60148	-10.35250
		4.12353	-5.90868
			10.79389
		0.26912	0.13583
			1.31482
11.24884	-41.87138		11.54246
	166.79910		-49.53846
			17.03989
	10.94195		-6.57414
			5.19614
0.73792			-0.89312
			2.32722
			1.24627
593.09132	-1035.6807	204.24579	
	1812.7582	-355.85713	
		70.74630	
	4.20953	0.80536	
		0.40917	
1.37726		0.93442	
		0.88906	
3.43022	-8.31506		
	22.78061		
		0.25509	
	2.62437		
0.39517			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.50, B= 3.0, P= 1.0

13998.924	-26986.471	4602.0298	1563.9512
	52091.690	-8859.1404	-3050.6329
		1515.6855	507.83798
			194.69738
	68.43256	12.43767	-35.72087
		2.80640	-6.29797
			19.97371
18.39031		12.48908	-16.45090
		9.02733	-10.97768
			16.04392
		0.54585	0.19432
			1.32790
25.92002	-87.73151		22.01811
	310.25508		-82.33366
			24.54373
	13.31018		-7.80894
			5.84015
1.11199			-1.26356
			2.69451
			1.25873
1436.1286	-2481.5656	522.70525	
	4292.5832	-902.03674	
		191.06870	
	4.54957	1.17441	
		0.82057	
1.52211		1.23293	
		1.51610	
6.16763	-13.87022		
	34.06108		
		0.51741	
	2.86874		
0.51946			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.75, B= 3.0, P= 1.0

87477.856	-163457.41	30616.039	7100.8397
	305564.55	-57170.542	-13338.582
		10727.380	2465.9825
			614.29277
	134.98664	37.28802	-70.25409
		12.18990	-19.21312
			37.89633
38.64435		33.47168	-34.44455
		30.88104	-29.64053
			32.03361
		1.88965	0.19351
			1.33244
99.40414	-292.16269		62.90334
	879.63234		-196.36427
			47.41904
	20.92528		-11.48255
			7.61356
2.36469			-2.31745
			3.58377
			1.31262
5396.5958	-9271.7562	2110.8254	
	15934.319	-3624.8866	
		828.07763	
	4.74614	1.66979	
		2.44901	
1.60741		1.60033	
		3.45482	
15.96024	-31.67729		
	66.47957		
		1.86154	
	3.60764		
0.86611			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.00, B= 3.0, P= 1.0

1102.3676	-2327.4152	320.37804	229.06366
	4947.6194	-673.00873	-502.52538
		93.61254	64.76635
			59.53022
	33.77641	3.40148	-18.90610
		0.50196	-1.80578
			11.93252
7.52564		3.78725	-7.32987
		2.06533	-3.59056
			8.48915
		0.15941	0.09817
			1.34997
5.91104	-24.12108		7.40835
	109.15720		-36.90060
			14.72126
	10.72679		-6.66947
			5.43632
0.58087			-0.74578
			2.24701
			1.28951
220.96382	-393.77024	71.16649	
	705.54247	-126.28242	
		23.14950	
	3.82124	0.54036	
		0.22869	
1.19675		0.68702	
		0.54668	
2.18285	-5.55115		
	16.66143		
		0.15228	
	2.54443		
0.33335			

AD-A058 263 AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OHIO F/G 12/1
ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION. VOLUM--ETC(U)
1970 H L HARTER

UNCLASSIFIED

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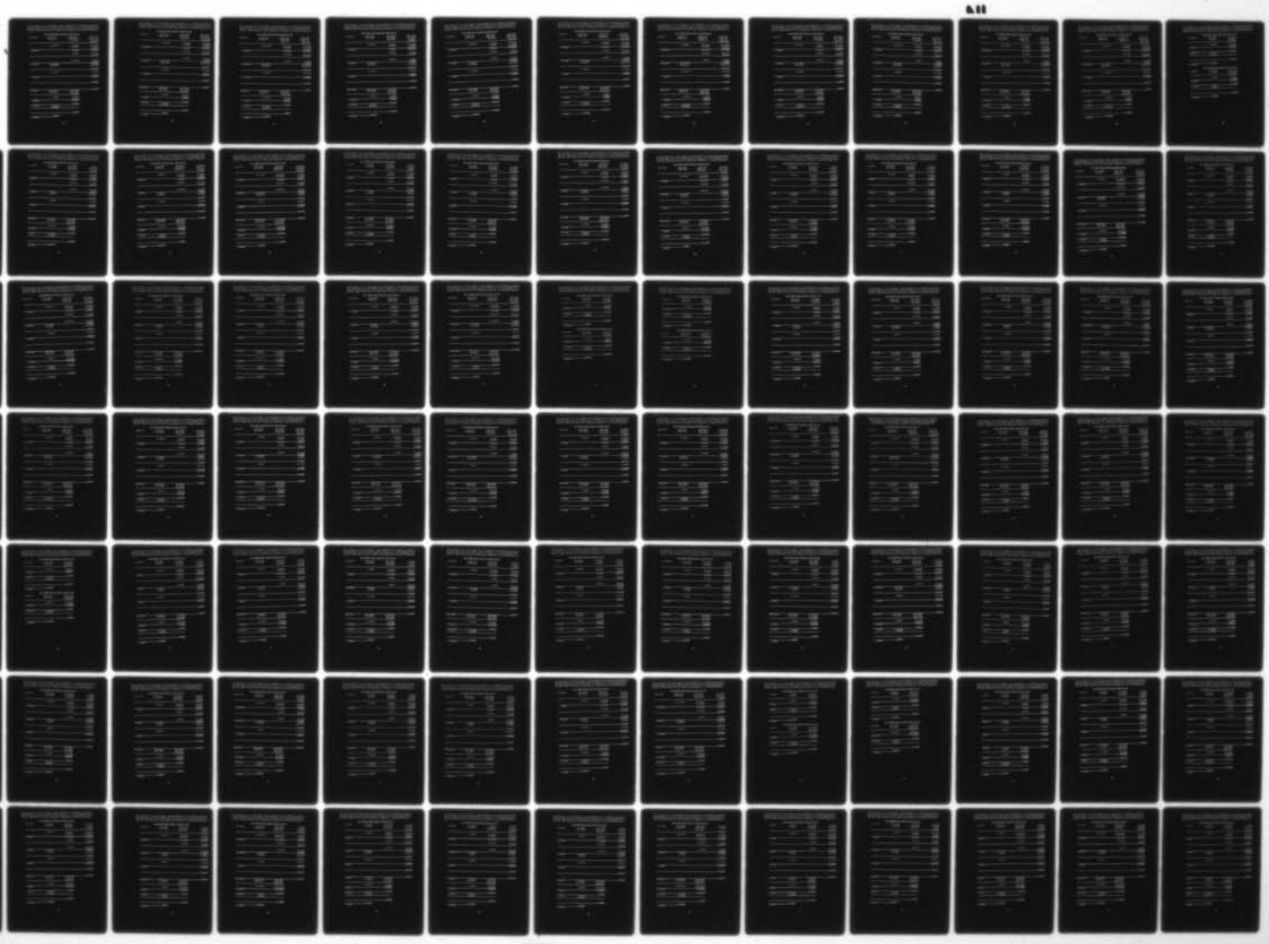

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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.25, B= 3.0, P= 1.0

5113.2366	-10257.351	1588.4014	783.61144
	20628.426	-3179.4610	-1600.1739
		494.62869	239.79250
			136.83958
	51.77963	6.93410	-28.21882
		1.19971	-3.63249
			16.74991
12.83479		7.43500	-12.06468
		4.57811	-6.84244
			12.71201
		0.27112	0.14645
			1.37124
12.40202	-47.14642		13.56565
	190.92943		-58.79365
			20.58987
	11.70174		-7.22366
			5.75141
0.76010			-0.95233
			2.48531
			1.29213
625.88801	-1093.9607	215.23044	
	1916.3223	-375.37695	
		74.42541	
	4.23896	0.81439	
		0.41194	
1.38448		0.94100	
		0.89506	
3.46428	-8.41018		
	23.04624		
		0.25548	
	2.62896		
0.39518			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.50, B= 3.0, P= 1.0

18235.529	-35428.569	5951.0160	2200.6283
	68913.948	-11547.198	-4319.3492
		1945.2201	710.55828
			290.40096
	82.19249	14.62663	-43.89815
		3.15465	-7.59880
			24.83340
21.74921		14.61721	-19.94333
		10.37569	-13.19039
			19.67526
		0.55175	0.21313
			1.38786
29.57333	-102.20331		26.81588
	367.58284		-101.33979
			30.84521
	14.37555		-8.66602
			6.52967
1.15656			-1.36079
			2.90660
			1.30553
1559.3964	-2696.9895	566.47921	
	4669.0601	-978.53649	
		206.61339	
	4.59347	1.19419	
		0.82948	
1.53415		1.24711	
		1.53279	
6.26042	-14.10159		
	34.63805		
		0.51902	
	2.87422		
0.51948			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.75, B= 3.0, P= 1.0

129994.69	-244522.67	45101.022	11465.522
	460129.08	-84788.433	-21660.792
		15662.262	3952.9271
			1062.4961
	176.92764	47.51320	-93.90887
		14.68298	-24.97997
			51.23780
49.98522		42.59168	-45.49654
		38.21526	-38.52807
			42.80421
		1.92350	0.23888
			1.39326
121.86678	-366.05282		82.68092
	1122.6955		-261.42502
			64.83483
	23.17792		-13.07526
			8.73969
2.51593			-2.55623
			3.96077
			1.36360
6268.8627	-10778.477	2444.5132	
	18536.971	-4201.2860	
		955.73076	
	4.81103	1.72979	
		2.50449	
1.62700		1.64025	
		3.53614	
16.42755	-32.66936		
	68.58565		
		1.88255	
	3.61630		
0.86617			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.00, B= 3.0, P= 1.0

1225.8153	-2609.3509	354.44769	269.27089
	5591.5204	-750.81837	-594.35493
		103.01525	75.86275
			72.62763
	37.08523	3.68221	-21.16727
		0.52578	-1.99762
			13.47777
8.13010		4.06919	-8.09205
		2.19684	-3.94606
			9.45022
		0.16017	0.10408
			1.39605
6.25646	-25.98738		8.24761
	119.24113		-41.43534
			16.76059
	11.29762		-7.17732
			5.88812
0.59277			-0.78279
			2.36214
			1.32841
227.47889	-405.74767	73.18240	
	727.56200	-129.98851	
		23.77327	
	3.84135	0.54488	
		0.22970	
1.20103		0.69025	
		0.54911	
2.19794	-5.59772		
	16.80514		
		0.15241	
	2.54884		
0.33336			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.25, B= 3.0, P= 1.0

6025.8421	-12171.963	1862.1827	976.89775
	24645.220	-3753.8424	-2005.6893
		576.76307	297.77748
			177.78242
	58.33493	7.69310	-32.39438
		1.28759	-4.11594
			19.40967
14.26309		8.20729	-13.68687
		4.99569	-7.71955
			14.55444
		0.27304	0.15616
			1.42051
13.45234	-52.01173		15.46993
	213.46682		-67.61490
			24.04265
	12.37018		-7.80243
			6.25253
0.77955			-1.00461
			2.62585
			1.33119
657.88055	-1150.8886	225.92337	
	2017.6206	-394.40408	
		77.99933	
	4.26929	0.82366	
		0.41478	
1.39208		0.94789	
		0.90130	
3.49842	-8.50581		
	23.31410		
		0.25587	
	2.63367		
0.39520			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.50, B= 3.0, P= 1.0

22707.032	-44390.525	7367.4997	2905.3667
	86875.884	-14386.162	-5731.8393
		2393.9349	933.80173
			401.48927
	95.77498	16.74093	-52.06779
		3.48377	-8.87049
			29.74735
25.03302		16.67621	-23.40183
		11.66673	-15.35891
			23.31779
		0.55755	0.23066
			1.44084
33.04441	-116.12068		31.52759
	423.38539		-120.23196
			37.24142
	15.32812		-9.44152
			7.16103
1.19633			-1.44808
			3.09823
			1.34542
1682.4209	-2912.2181	610.06762	
	5045.5975	-1054.7934	
		222.05706	
	4.63896	1.21461	
		0.83864	
1.54683		1.26195	
		1.55016	
6.35400	-14.33552		
	35.22279		
		0.52063	
	2.87985		
0.51951			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.75, B= 3.0, P= 1.0

181853.01	-343884.98	62661.957	17073.430
	650510.94	-118435.72	-32405.902
		21608.987	5851.9132
			1669.0282
	222.65884	58.36341	-119.95655
		17.25744	-31.15995
			66.07418
62.24519		52.30126	-57.56968
		45.90510	-48.08957
			54.69344
		1.95920	0.28310
			1.44808
145.23201	-443.87729		103.99317
	1381.9145		-332.41352
			84.27608
	25.27797		-14.57583
			9.81192
2.65658			-2.77958
			4.31545
			1.40717
7199.2725	-12386.759	2799.4403	
	21317.004	-4814.8036	
		1091.1263	
	4.87979	1.79306	
		2.56270	
1.64802		1.68273	
		3.62203	
16.90877	-33.69285		
	70.76247		
		1.90385	
	3.62523		
0.86625			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.00, B= 3.0, P= 1.0

1342.7244	-2878.2305	386.58361	308.78655
	6209.9205	-824.72781	-685.23892
		111.84878	86.72469
			85.98538
	40.21712	3.94322	-23.33176
		0.54753	-2.17801
			14.97369
8.69585		4.33126	-8.81423
		2.31824	-4.28059
			10.37212
		0.16091	0.10963
			1.43788
6.57305	-27.71878		9.03946
	128.71008		-45.76599
			18.74127
	11.81898		-7.64626
			6.30991
0.60358			-0.81662
			2.46806
			1.36319
233.82504	-417.43366	75.14209	
	749.08092	-133.59714	
		24.37842	
	3.86195	0.54948	
		0.23073	
1.20550		0.69361	
		0.55163	
2.21305	-5.64450		
	16.94996		
		0.15255	
	2.55337		
0.33338			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.25, B= 3.0, P= 1.0

6949.0859	-14119.355	2138.1030	1179.6570
	28752.850	-4335.8384	-2433.3743
		659.22462	358.37341
			222.31593
	64.73291	8.42157	-36.51279
		1.37054	-4.58486
			22.06072
15.64487		8.94912	-15.27412
		5.39396	-8.57170
			16.37773
		0.27491	0.16535
			1.46558
14.44723	-56.66850		17.32288
	235.26381		-76.28813
			27.49387
	12.98462		-8.34006
			6.72296
0.79737			-1.05281
			2.75620
			1.36612
689.56764	-1207.3388	236.49527	
	2118.1857	-413.23776	
		81.52648	
	4.30045	0.83315	
		0.41767	
1.40000		0.95503	
		0.90775	
3.53272	-8.60216		
	23.58469		
		0.25626	
	2.63850		
0.39522			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.50, B= 3.0, P= 1.0

27516.202	-54075.148	8884.5924	3692.6094
	106378.65	-17441.252	-7317.1972
		2872.5151	1182.1408
			530.37209
	109.55868	18.84826	-60.43997
		3.80596	-10.15046
			34.83262
28.33876		18.73126	-26.92028
		12.94428	-17.54617
			27.06265
		0.56334	0.24751
			1.48985
36.45781	-129.94432		36.28759
	479.36901		-139.50947
			43.87960
	16.21648		-10.17185
			7.76144
1.23332			-1.52976
			3.27854
			1.38110
1807.1492	-3130.6287	654.17348	
	5428.0543	-1132.0267	
		237.65358	
	4.68601	1.23564	
		0.84805	
1.56010		1.27740	
		1.56815	
6.44867	-14.57267		
	35.81686		
		0.52223	
	2.88563		
0.51955			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.75, B= 3.0, P= 1.0

245521.10	-466365.72	84116.659	24247.264
	886132.08	-159708.90	-46206.634
		28838.746	8269.2993
			2477.4353
	273.44886	70.14685	-149.11580
		19.99133	-37.92490
			82.81500
75.76462		62.87515	-70.99632
		54.17532	-58.59082
			68.02800
		1.99681	0.32724
			1.49989
170.19786	-527.89357		127.42757
	1664.6523		-411.27773
			106.27423
	27.31308		-16.04247
			10.86889
2.79255			-2.99659
			4.66179
			1.44626
8207.2096	-14130.108	3183.0081	
	24332.338	-5478.2305	
		1237.0921	
	4.95251	1.85967	
		2.62372	
1.67046		1.72779	
		3.71250	
17.40649	-34.75313		
	73.02114		
		1.92541	
	3.63439		
0.86635			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.00, B= 1.0, P= 2.0

10.95154	-16.98359	20.90659
	27.02194	-32.85474
		42.37828
	0.68388	-0.43291
		2.46741
0.27717		0.25702
		2.43171
0.63764	-0.77527	
	1.55055	
		2.19337
	0.60793	
0.25000		

Q1= 0.000, Q2= 0.25, B= 1.0, P= 2.0

27.93981	-46.26129	65.09647
	77.52287	-109.14889
		157.75667
	0.92583	-1.36554
		6.08954
0.33368		-0.03745
		4.07968
1.07850	-1.22225	
	2.00479	
		4.07548
	0.61962	
0.33333		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.50, B= 1.0, P= 2.0

64.30758	-115.67990	178.96342
	210.14187	-326.80139
		515.08876
	2.05071	-4.87247
		17.04630
0.62756		-0.93577
		6.86473
2.12819	-2.13540	
	2.80062	
		5.46939
	0.65798	
0.50000		

Q1= 0.000, Q2= 0.75, B= 1.0, P= 2.0

229.62259	-481.24570	823.20532
	1020.2614	-1755.6754
		3036.1249
	11.66105	-30.39205
		84.90390
2.62447		-4.92678
		14.94227
6.42130	-5.21742	
	5.02121	
		5.69345
	0.78196	
1.00000		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.00, B= 1.0, P= 2.0

19.58946	-36.53880	35.91307	3.07589
	71.38184	-66.82119	-7.01306
		68.44919	5.34011
			1.12288
	3.22868	0.16485	-1.27583
		2.61029	-0.29887
			0.63991
0.88605		1.70877	-0.51394
		5.89727	-1.22487
			0.43386
		2.60187	-0.23372
			0.13576
0.74704	-1.47989		0.27410
	6.14994		-1.79995
			0.70626
	3.21827		-1.25695
			0.60569
0.39093			-0.15903
			0.17946
			0.11476
11.16370	-17.32798	21.28494	
	27.58096	-33.46889	
		43.05299	
	0.68497	-0.43102	
		2.47070	
0.27725		0.25782	
		2.43924	
0.64066	-0.78132		
	1.56265		
		2.19948	
	0.60978		
0.25000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.25, B= 1.0, P= 2.0

65.20912	-121.78161	143.18051	7.54133
	230.67259	-267.33702	-15.35002
		321.36413	15.77900
			1.56537
	3.23874	0.06044	-1.26616
		6.98083	-0.77960
			0.69323
0.91556		2.04222	-0.56258
		11.53501	-2.01084
			0.54391
		6.97970	-0.75598
			0.19823
1.41650	-2.67233		0.51116
	8.27974		-2.22375
			0.79062
	3.23822		-1.25941
			0.60616
0.55400			-0.20657
			0.19337
			0.11635
28.87794	-47.83127	67.16350	
	80.15025	-112.60809	
		162.31104	
	0.92612	-1.36349	
		6.10408	
0.33368		-0.03763	
		4.10090	
1.08602	-1.23460		
	2.02505		
		4.09665	
	0.62155		
0.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.50, B= 1.0, P= 2.0

189.42012	-363.43918	485.41667	16.32929
	700.91501	-933.53703	-32.42781
		1265.8466	39.91057
			2.19151
	3.58659	-2.17118	-1.09691
		21.89561	-1.93562
			0.78381
0.96926		1.35808	-0.48521
		22.48413	-3.27950
			0.69124
		20.58126	-2.59965
			0.44834
3.27644	-5.45390		1.02471
	12.44974		-2.99455
			0.93318
	3.37129		-1.28884
			0.61270
0.88723			-0.28712
			0.21290
			0.11998
67.74793	-121.81430	188.03657	
	221.07996	-342.97950	
		539.01720	
	2.05153	-4.87998	
		17.11561	
0.62867		-0.94395	
		6.92493	
2.15122	-2.16563		
	2.84029		
		5.50759	
	0.66016		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.75, B= 1.0, P= 2.0

1004.2517	-2083.7566	3195.5008	55.36577
	4335.4692	-6663.1142	-114.58828
		10304.158	168.94224
			4.08776
	11.81049	-32.65916	0.29206
		136.16466	-7.23007
			1.03537
2.73574		-6.99193	0.29120
		63.72317	-7.16668
			1.05914
		45.85335	-6.42244
			1.02815
13.27072	-17.40769		2.97380
	26.81149		-5.34292
			1.31786
	3.97717		-1.44207
			0.65147
1.96856			-0.49515
			0.25314
			0.12859
254.36214	-531.74059	907.29928	
	1123.3246	-1927.3164	
		3321.9756	
	11.72810	-30.61966	
		85.67648	
2.65568		-5.02154	
		15.22994	
6.56021	-5.35117		
	5.15000		
		5.73486	
	0.78504		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.00, B= 1.0, P= 2.0

22.34485	-43.44464	40.65641	4.42907
	88.69305	-78.70930	-10.40623
		76.61477	7.66949
			1.78837
	4.22449	0.33816	-1.79489
		2.64049	-0.38919
			0.91047
1.06429		2.10212	-0.66823
		6.76540	-1.56536
			0.56742
		2.61342	-0.24551
			0.14786
0.77010	-1.67675		0.35917
	7.83196		-2.52707
			1.02062
	4.18118		-1.74505
			0.85311
0.41113			-0.18185
			0.20523
			0.12480
11.37587	-17.67268	21.66224	
	28.14099	-34.08187	
		43.72394	
	0.68607	-0.42908	
		2.47413	
0.27734		0.25865	
		2.44700	
0.64371	-0.78743		
	1.57490		
		2.20577	
	0.61165		
0.25000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.25, B= 1.0, P= 2.0

80.39046	-154.46053	174.43016	11.71254
	301.02099	-334.60285	-24.33155
		385.68950	24.36440
			2.71300
	4.24382	0.54355	-1.82732
		7.21327	-1.04932
			1.00654
1.13335		2.73804	-0.77252
		13.75840	-2.68158
			0.74628
		7.14365	-0.81528
			0.21972
1.50348	-3.13458		0.69361
	10.73809		-3.19435
			1.17388
	4.20286		-1.74825
			0.85389
0.58846			-0.23886
			0.22363
			0.12667
29.82522	-49.41665	69.24448	
	82.80359	-116.09087	
		166.88254	
	0.92639	-1.36145	
		6.11934	
0.33368		-0.03781	
		4.12281	
1.09365	-1.24713		
	2.04565		
		4.11853	
	0.62349		
0.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.50, B= 1.0, P= 2.0

251.87173	-491.56136	634.37042	27.40409
	963.77004	-1239.1165	-55.15266
		1621.1218	66.32150
			4.15832
	4.42229	-1.05780	-1.66991
		23.38066	-2.69913
			1.17670
1.15572		2.37131	-0.72598
		27.99309	-4.58813
			1.00215
		23.12763	-3.09857
			0.54613
3.63262	-6.67562		1.45145
	16.64212		-4.45933
			1.44505
	4.37444		-1.79202
			0.86511
0.95485			-0.33731
			0.25015
			0.13099
71.27356	-128.09488	197.29918	
	232.26824	-359.47997	
		563.35210	
	2.05246	-4.88825	
		17.18935	
0.62981		-0.95240	
		6.98741	
2.17474	-2.19653		
	2.88089		
		5.54720	
	0.66235		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.75, B= 1.0, P= 2.0

1550.3552	-3220.1360	4803.5369	108.78495
	6700.1486	-10009.234	-225.75266
		15039.281	326.20024
			9.32232
	11.82588	-32.13800	0.19707
		156.26152	-10.85318
			1.68913
2.73641		-6.96741	0.28672
		86.66368	-11.04767
			1.71588
		68.92333	-10.31762
			1.68584
16.10854	-23.19308		4.59680
	38.60953		-8.65356
			2.24708
	5.21612		-2.03508
			0.93532
2.17625			-0.60147
			0.30756
			0.14132
280.91129	-585.76114	997.00934	
	1233.2423	-2109.8531	
		3625.1083	
	11.80289	-30.87178	
		86.52637	
2.68849		-5.12137	
		15.53363	
6.70497	-5.49069		
	5.28446		
		5.77782	
	0.78814		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.00, B= 1.0, P= 2.0

24.61352	-49.36295	44.55036	5.67323
	104.13378	-88.86743	-13.65277
		83.29834	9.80494
			2.47117
	5.13527	0.47931	-2.27498
		2.66239	-0.46359
			1.16354
1.21380		2.42417	-0.79865
		7.45917	-1.84629
			0.68119
		2.61765	-0.25125
			0.15570
0.78670	-1.83409		0.42927
	9.32494		-3.19230
			1.31705
	5.04898		-2.19152
			1.08281
0.42596			-0.19862
			0.22419
			0.13158
11.58911	-18.01941	22.04053	
	28.70477	-34.69697	
		44.39503	
	0.68717	-0.42711	
		2.47768	
0.27743		0.25952	
		2.45497	
0.64679	-0.79362		
	1.58733		
		2.21221	
	0.61354		
0.25000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.25, B= 1.0, P= 2.0

94.09321	-184.69322	202.44822	15.90036
	367.72661	-396.41912	-33.57268
		442.97826	32.92688
			3.99371
	5.19690	0.96143	-2.36226
		7.39659	-1.28386
			1.30679
1.32977		3.34399	-0.96175
		15.62786	-3.26536
			0.92859
		7.21872	-0.84684
			0.23301
1.57111	-3.52329		0.85224
	12.97305		-4.10657
			1.54623
	5.07193		-2.19538
			1.08394
0.61424			-0.26304
			0.24631
			0.13367
30.78834	-51.02867	71.35480	
	85.50170	-119.62302	
		171.50655	
	0.92666	-1.35939	
		6.13524	
0.33368		-0.03797	
		4.14536	
1.10138	-1.25986		
	2.06660		
		4.14104	
	0.62546		
0.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.50, B= 1.0, P= 2.0

313.10644	-619.12711	778.86983	39.51919
	1229.5223	-1540.1384	-80.39369
		1962.1085	94.90829
			6.55689
	5.27924	-0.02500	-2.24965
		24.62616	-3.39791
			1.56892
1.34439		3.33167	-0.96313
		32.88257	-5.79538
			1.30026
		24.62604	-3.40856
			0.61027
3.92976	-7.76066		1.84482
	20.60531		-5.89633
			1.96613
	5.27921		-2.25310
			1.10008
1.00683			-0.37594
			0.27885
			0.13848
74.91949	-134.58458	206.84605	
	243.81980	-376.47325	
		588.35062	
	2.05349	-4.89721	
		17.26710	
0.63098		-0.96109	
		7.05201	
2.19876	-2.22812		
	2.92244		
		5.58811	
	0.66457		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.75, B= 1.0, P= 2.0

2180.9851	-4537.0584	6629.0779	178.24790
	9450.2341	-13821.432	-370.81363
		20323.932	527.25689
			16.97970
	11.88495	-31.09760	-0.00819
		174.93010	-14.52546
			2.41183
2.74288		-6.59299	0.22024
		109.40901	-15.07626
			2.42950
		93.56161	-14.54688
			2.41182
18.77195	-28.90778		6.27198
	50.87306		-12.24891
			3.30125
	6.35668		-2.59040
			1.20569
2.34559			-0.68826
			0.35204
			0.15008
309.79090	-644.36572	1094.0897	
	1352.1669	-2306.8558	
		3951.4500	
	11.88492	-31.14690	
		87.44909	
2.72292		-5.22629	
		15.85341	
6.85595	-5.63633		
	5.42496		
		5.82222	
	0.79128		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.00, B= 1.0, P= 2.0

26.65551	-54.86196	48.04809	6.88961
	118.94341	-98.28664	-16.92901
		89.28961	11.88845
			3.19607
	6.02737	0.60521	-2.74892
		2.68016	-0.53047
			1.41533
1.35075		2.71395	-0.91880
		8.07231	-2.10051
			0.78660
		2.61939	-0.25445
			0.16162
0.80011	-1.97243		0.49225
	10.75319		-3.84265
			1.61319
	5.89071		-2.62914
			1.31034
0.43831			-0.21260
			0.24002
			0.13690
11.80394	-18.36899	22.42078	
	29.27361	-35.31573	
		45.06809	
	0.68827	-0.42509	
		2.48134	
0.27753		0.26041	
		2.46314	
0.64990	-0.79987		
	1.59991		
		2.21880	
	0.61545		
0.25000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.25, B= 1.0, P= 2.0

107.37910	-214.58391	229.47693	20.29258
	434.97623	-457.22792	-43.45531
		497.96539	41.86215
			5.44633
	6.15710	1.35325	-2.90311
		7.55653	-1.50456
			1.61142
1.51996		3.91585	-1.14493
		17.34745	-3.81616
			1.10503
		7.25910	-0.86649
			0.24259
1.62946	-3.87989		1.00128
	15.15312		-5.01781
			1.92713
	5.91476		-2.63367
			1.31186
0.63603			-0.28351
			0.26553
			0.13916
31.77063	-52.67291	73.50200	
	88.25398	-123.21718	
		176.20012	
	0.92692	-1.35733	
		6.15175	
0.33368		-0.03812	
		4.16851	
1.10922	-1.27278		
	2.08790		
		4.16416	
	0.62744		
0.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.50, B= 1.0, P= 2.0

376.66149	-753.15881	927.62179	53.14250
	1512.1856	-1853.8404	-109.12586
		2310.2672	126.79259
			9.47831
	6.19626	0.99889	-2.86403
		25.76982	-4.08391
			1.98053
1.54339		4.29849	-1.20870
		37.58049	-6.98855
			1.60332
		25.60879	-3.62220
			0.65672
4.20146	-8.80217		2.23255
	24.59832		-7.38298
			2.51965
	6.15755		-2.70573
			1.33333
1.05173			-0.40935
			0.30371
			0.14439
78.70489	-141.31760	216.72766	
	255.79569	-394.04949	
		614.14612	
	2.05462	-4.90681	
		17.34868	
0.63218		-0.97002	
		7.11869	
2.22329	-2.26043		
	2.96498		
		5.63029	
	0.66680		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.75, B= 1.0, P= 2.0

2933.7772	-6114.0673	8779.7562	268.63224
	12753.881	-18326.831	-560.16149
		26468.345	785.46123
			27.83665
	12.00676	-29.59291	-0.32498
		193.64443	-18.45993
			3.23925
2.76192		-5.92107	0.09710
		133.40091	-19.46908
			3.23387
		120.70716	-19.26091
			3.23045
21.46374	-34.91478		8.08864
	64.27977		-16.30372
			4.52770
	7.48434		-3.14604
			1.47948
2.49911			-0.76704
			0.39247
			0.15704
341.39302	-708.33569	1199.8124	
	1481.6570	-2520.8630	
		4305.1384	
	11.97415	-31.44492	
		88.44444	
2.75900		-5.33647	
		16.18985	
7.01355	-5.78851		
	5.57190		
		5.86803	
	0.79445		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.00, B= 1.0, P= 2.0

28.56647	-60.15077	51.31636	8.10817
	133.58167	-107.33195	-20.30198
		94.87927	13.97251
			3.97337
	6.92563	0.72196	-3.22907
		2.69535	-0.59288
			1.67198
1.48105		2.98563	-1.03365
		8.63877	-2.33999
			0.88784
		2.62009	-0.25626
			0.16643
0.81152	-2.09926		0.55100
	12.16264		-4.49560
			1.91569
	6.73225		-3.07027
			1.54157
0.44919			-0.22493
			0.25400
			0.14137
12.02071	-18.72198	22.80365	
	29.84843	-35.93921	
		45.74435	
	0.68938	-0.42305	
		2.48512	
0.27763		0.26133	
		2.47150	
0.65304	-0.80621		
	1.61266		
		2.22551	
	0.61737		
0.25000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.25, B= 1.0, P= 2.0

120.65041	-244.94501	256.36391	24.96930
	504.43596	-518.73782	-54.15521
		552.43705	51.33676
			7.09484
	7.14747	1.73336	-3.46243
		7.70245	-1.71922
			1.92731
1.70952		4.47417	-1.32750
		18.99188	-4.35386
			1.28085
		7.28209	-0.87954
			0.25001
1.68219	-4.21957		1.14596
	17.34168		-5.95004
			2.32423
	6.75740		-3.07554
			1.54357
0.65549			-0.30180
			0.28274
			0.14378
32.77453	-54.35347	75.69148	
	91.06728	-126.88244	
		180.97533	
	0.92717	-1.35525	
		6.16885	
0.33368		-0.03825	
		4.19226	
1.11717	-1.28591		
	2.10956		
		4.18788	
	0.62943		
0.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.50, B= 1.0, P= 2.0

444.10922	-896.91064	1084.4130	68.56589
	1818.5674	-2188.0088	-141.99946
		2674.7502	162.64520
			13.00623
	7.19164	2.04151	-3.52569
		26.86224	-4.77700
			2.42036
1.75626		5.29524	-1.46771
		42.24825	-8.20140
			1.91847
		26.28271	-3.77615
			0.69190
4.46014	-9.83526		2.62532
	28.72466		-8.95185
			3.11616
	7.03649		-3.16264
			1.57085
1.09257			-0.43978
			0.32638
			0.14936
82.64547	-148.32185	226.98455	
	268.24554	-412.28080	
		640.84371	
	2.05584	-4.91704	
		17.43402	
0.63340		-0.97918	
		7.18747	
2.24835	-2.29347		
	3.00854		
		5.67375	
	0.66906		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.75, B= 1.0, P= 2.0

3842.6928	-8023.7471	11348.159	385.53571
	16766.221	-23723.168	-805.78554
		33726.169	1115.7880
			42.87755
	12.21068	-27.60828	-0.76646
		213.02755	-22.76788
			4.19692
2.79860		-4.94763	-0.08602
		159.35230	-24.34877
			4.15145
		150.60538	-24.50085
			4.14881
24.27194	-41.39148		10.09612
	79.21848		-20.93430
			5.96310
	8.63266		-3.71717
			1.76354
2.64498			-0.84201
			0.43100
			0.16295
376.12838	-778.48441	1315.4930	
	1623.3237	-2754.4822	
		4690.3944	
	12.07070	-31.76625	
		89.51389	
2.79681		-5.45215	
		16.54374	
7.17823	-5.94767		
	5.72571		
		5.91524	
	0.79765		
1.00001			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.00, B= 2.0, P= 1.0

110.16640	-144.09282	40.76792
	190.15126	-53.11879
		15.39744
	1.68418	0.20385
		0.31097
0.97575		0.51556
		0.55870
2.22492	-3.44984	
	6.89969	
		0.28629
	1.55055	
0.50000		

Q1= 0.000, Q2= 0.25, B= 2.0, P= 1.0

284.65294	-370.25927	116.11049
	483.30596	-150.78329
		47.96163
	1.69516	0.24619
		0.59993
0.99840		0.59585
		0.91979
3.56059	-5.22739	
	9.26861	
		0.56418
	1.59414	
0.61240		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.50, B= 2.0, P= 1.0

639.97254	-836.83076	283.86827
	1095.9760	-371.08973
		127.20560
	1.73263	0.09760
		1.29208
1.01173		0.52329
		1.55724
6.50045	-8.71783	
	13.41683	
		1.28658
	1.72525	
0.83589		

Q1= 0.000, Q2= 0.75, B= 2.0, P= 1.0

2048.9271	-2737.5187	1017.8928
	3660.2521	-1361.5737
		509.94393
	2.72396	-1.59338
		4.26184
1.52481		-0.43418
		3.45342
17.12382	-19.69817	
	24.78777	
		3.32979
	2.12824	
1.47022		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.00, B= 2.0, P= 1.0

280.94928	-403.29337	96.66887	20.82882
	583.66169	-137.94235	-31.69561
		33.69795	6.80458
			2.59981
	4.74744	0.82260	-1.79653
		0.43618	-0.36219
			1.05561
2.28521		1.35468	-1.07193
		1.09671	-0.68635
			0.87858
		0.29365	-0.05091
			0.37577
3.63658	-7.57996		1.30863
	18.99552		-3.84113
			1.22577
	3.19611		-1.11347
			0.75486
0.61188			-0.22414
			0.44905
			0.36694
114.07532	-149.35808	42.15275	
	197.24353	-54.98414	
		15.88806	
	1.68995	0.20619	
		0.31191	
0.97738		0.51729	
		0.56053	
2.23950	-3.47919		
	6.95878		
		0.28675	
	1.55365		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.25, B= 2.0, P= 1.0

995.03358	-1387.6432	376.18989	53.11818
	1940.6060	-523.19994	-76.23140
		143.19554	19.40691
			4.07665
	5.44161	1.42289	-2.15443
		0.97036	-0.67535
			1.24102
2.79015		2.07232	-1.39159
		2.13746	-1.14557
			1.08211
		0.59829	-0.11200
			0.38805
6.74280	-13.14140		2.13416
	28.96710		-5.32351
			1.44648
	3.35514		-1.16413
			0.77100
0.78099			-0.28094
			0.46814
			0.36708
302.91086	-394.35819	123.32044	
	515.11453	-160.29980	
		50.80880	
	1.70150	0.25049	
		0.60285	
1.00056		0.59911	
		0.92470	
3.59403	-5.28702		
	9.37491		
		0.56597	
	1.59742		
0.61240			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.50, B= 2.0, P= 1.0

2925.4862	-4025.0937	1192.7586	117.84951
	5543.9852	-1638.8030	-164.67628
		488.72271	46.74906
			6.25935
	5.97268	2.27994	-2.53047
		2.41954	-1.29972
			1.51193
3.15170		2.94029	-1.71023
		4.29229	-1.92928
			1.36787
		1.54922	-0.33376
			0.43984
14.48333	-25.49155		3.75548
	48.69097		-7.91562
			1.78754
	3.82428		-1.30574
			0.81376
1.13755			-0.38864
			0.50071
			0.36793
706.64465	-924.60929	312.57891	
	1211.5426	-408.88926	
		139.56916	
	1.73751	0.10465	
		1.30226	
1.01342		0.52815	
		1.57120	
6.59337	-8.86148		
	13.63891		
		1.29595	
	1.72910		
0.83589			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.75, B= 2.0, P= 1.0

14987.905	-20531.924	6741.6772	407.81602
	28132.839	-9232.5134	-561.41864
		3042.6929	179.83516
			13.29704
	6.16530	2.90712	-2.75166
		10.23361	-3.60368
			2.20050
3.28459		3.59911	-1.91884
		12.80657	-4.40878
			2.09337
		8.86282	-2.30620
			0.97240
50.40943	-75.49714		9.35628
	118.40993		-15.74064
			2.66807
	5.33946		-1.72794
			0.93149
2.27311			-0.67982
			0.57561
			0.37230
2480.3145	-3313.3893	1226.1887	
	4428.9972	-1639.6336	
		610.52072	
	2.72444	-1.59918	
		4.33198	
1.52573		-0.44209	
		3.52140	
17.59921	-20.29849		
	25.54587		
		3.39330	
	2.13409		
1.47023			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.00, B= 2.0, P= 1.0

339.51101	-495.45342	115.34072	30.36828
	728.69898	-167.32633	-46.71016
		39.65135	9.84585
			4.15531
	5.67651	0.99209	-2.39329
		0.46711	-0.47105
			1.43895
2.64476		1.57303	-1.39066
		1.22931	-0.87990
			1.16115
		0.29372	-0.05277
			0.42991
3.99956	-8.72247		1.72796
	22.59188		-5.16127
			1.71048
	3.56942		-1.39283
			0.96393
0.63191			-0.26475
			0.53135
			0.42043
117.57018	-154.08101	43.38420	
	203.62606	-56.64831	
		16.32197	
	1.69596	0.20864	
		0.31291	
0.97922		0.51921	
		0.56254	
2.25394	-3.50845		
	7.01805		
		0.28724	
	1.55685		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.25, B= 2.0, P= 1.0

1310.4681	-1850.9170	488.83479	84.53967
	2621.0159	-688.63818	-122.38444
		183.42256	30.62674
			7.20999
	6.76406	1.79649	-2.97984
		1.07592	-0.90850
			1.75624
3.38192		2.53019	-1.88614
		2.49175	-1.52819
			1.49543
		0.59878	-0.11708
			0.44351
7.68695	-15.64490		2.91712
	35.60578		-7.39998
			2.09613
	3.76440		-1.46288
			0.98911
0.81270			-0.33437
			0.55818
			0.42061
319.21037	-415.91594	129.72536	
	543.62683	-168.77095	
		53.32563	
	1.70813	0.25503	
		0.60595	
1.00299		0.60273	
		0.93007	
3.62726	-5.34655		
	9.48157		
		0.56788	
	1.60080		
0.61240			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.50, B= 2.0, P= 1.0

4177.5034	-5804.4609	1677.4853	204.34744
	8072.8379	-2327.6908	-287.61773
		676.38998	80.23332
			12.24243
	7.78963	3.10274	-3.68576
		2.79223	-1.82282
			2.24654
4.03095		3.84954	-2.45292
		5.23265	-2.69726
			1.99524
		1.55636	-0.35472
			0.50258
17.24531	-31.65658		5.36428
	62.45269		-11.50724
			2.72516
	4.34185		-1.66023
			1.05656
1.19893			-0.46861
			0.60489
			0.42173
766.58986	-1003.6219	338.25186	
	1315.6876	-442.72826	
		150.56423	
	1.74264	0.11215	
		1.31321	
1.01536		0.53357	
		1.58638	
6.68612	-9.00544		
	13.86236		
		1.30599	
	1.73306		
0.83589			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.75, B= 2.0, P= 1.0

25118.191	-34606.084	11090.815	837.61362
	47686.327	-15274.798	-1158.5776
		4909.8982	364.32669
			31.55876
	8.48897	5.34963	-4.57226
		12.80299	-5.51752
			3.62695
4.47146		5.85659	-3.16899
		17.10253	-6.78680
			3.41019
		9.43174	-2.63615
			1.16428
65.49790	-102.32253		14.64751
	166.10459		-25.14953
			4.52482
	6.25367		-2.26681
			1.24914
2.46593			-0.84492
			0.71698
			0.42748
2886.7571	-3855.8176	1421.0763	
	5152.9087	-1899.7258	
		703.96874	
	2.72503	-1.60595	
		4.40943	
1.52661		-0.45019	
		3.59575	
18.08170	-20.90971		
	26.32015		
		3.46299	
	2.14013		
1.47025			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.00, B= 2.0, P= 1.0

388.83823	-574.08087	130.92904	39.16767
	854.03214	-192.17389	-60.73731
		44.57757	12.62649
			5.72574
	6.45898	1.12977	-2.91015
		0.49134	-0.56199
			1.78038
2.94075		1.74964	-1.65998
		1.33469	-1.04059
			1.40621
		0.29372	-0.05296
			0.46919
4.28580	-9.64582		2.08233
	25.57052		-6.30451
			2.14932
	3.86120		-1.61792
			1.13758
0.64716			-0.29588
			0.59492
			0.45964
120.90664	-158.59935	44.55587	
	209.74493	-58.23502	
		16.73343	
	1.70215	0.21116	
		0.31394	
0.98120		0.52126	
		0.56466	
2.26837	-3.53780		
	7.07774		
		0.28774	
	1.56012		
0.50001			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.25, B= 2.0, P= 1.0

1602.0389	-2283.1238	592.04677	116.39728
	3261.6961	-841.63258	-169.61053
		219.95831	41.90337
			10.69247
	7.93364	2.11474	-3.72854
		1.16252	-1.11221
			2.23554
3.89675		2.92035	-2.32679
		2.78744	-1.86213
			1.87260
		0.59883	-0.11836
			0.48325
8.46708	-17.75885		3.60885
	41.33410		-9.27452
			2.70963
	4.08673		-1.70532
			1.17145
0.83715			-0.37586
			0.62861
			0.45986
334.94791	-436.75784	135.89025	
	571.22865	-176.93538	
		55.74062	
	1.71500	0.25973	
		0.60918	
1.00561		0.60657	
		0.93572	
3.66058	-5.40644		
	9.58922		
		0.56984	
	1.60426		
0.61241			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.50, B= 2.0, P= 1.0

5436.6326	-7606.9019	2160.1742	300.25344
	10653.036	-3018.6560	-424.91250
		861.43047	116.99701
			19.55128
	9.50766	3.84596	-4.79979
		3.11379	-2.30473
			2.96893
4.85211		4.67416	-3.15936
		6.06080	-3.40666
			2.60300
		1.55805	-0.36316
			0.54584
19.65163	-37.14079		6.86479
	74.95196		-14.92731
			3.66108
	4.75737		-1.95313
			1.26305
1.24733			-0.53211
			0.68819
			0.46119
825.57291	-1081.4249	363.42473	
	1418.3156	-475.93315	
		161.30755	
	1.74798	0.11997	
		1.32467	
1.01746		0.53937	
		1.60236	
6.77966	-9.15103		
	14.08897		
		1.31643	
	1.73711		
0.83591			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.75, B= 2.0, P= 1.0

37186.957	-51448.175	16210.860	1407.1188
	71189.674	-22419.853	-1953.3500
		7082.0408	605.91586
			58.44948
	11.09464	7.88064	-6.60032
		15.26238	-7.48754
			5.20545
5.79544		8.22167	-4.55070
		21.32831	-9.25508
			4.85215
		9.66468	-2.79926
			1.27885
80.14095	-128.91392		20.17150
	214.39514		-35.18185
			6.60933
	7.02551		-2.73417
			1.53216
2.62614			-0.98303
			0.83605
			0.46808
3311.8324	-4423.0253	1623.9784	
	5909.7735	-2170.4723	
		800.82059	
	2.72568	-1.61328	
		4.49228	
1.52747		-0.45842	
		3.67499	
18.57806	-21.53985		
	27.12014		
		3.53741	
	2.14631		
1.47028			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.00, B= 2.0, P= 1.0

434.07154	-646.88594	145.12898	47.78399
	971.21595	-215.02926	-74.60624
		49.03533	15.33131
			7.36748
	7.17804	1.25283	-3.39496
		0.51240	-0.64496
			2.10727
3.20813		1.90707	-1.90808
		1.42740	-1.18667
			1.63643
		0.29373	-0.05241
			0.50157
4.53586	-10.46767		2.40819
	28.27165		-7.37554
			2.57402
	4.11482		-1.81802
			1.29546
0.66018			-0.32263
			0.64988
			0.49222
124.15435	-163.00509	45.69326	
	215.72161	-59.77796	
		17.13176	
	1.70851	0.21376	
		0.31500	
0.98330		0.52341	
		0.56687	
2.28282	-3.56730		
	7.13796		
		0.28826	
	1.56345		
0.50001			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.25, B= 2.0, P= 1.0

1889.9016	-2712.8250	693.28210	149.99607
	3903.1260	-992.74913	-219.76595
		255.56078	53.71904
			14.61514
	9.05061	2.41009	-4.45681
		1.24062	-1.30478
			2.71038
4.38232		3.28270	-2.74984
		3.05783	-2.17782
			2.24120
		0.59884	-0.11797
			0.51571
9.17456	-19.70752		4.26775
	46.70162		-11.08947
			3.32337
	4.36866		-1.92209
			1.33813
0.85823			-0.41188
			0.69013
			0.49247
350.48307	-457.35405	141.96049	
	598.53471	-184.98318	
		58.11251	
	1.72207	0.26458	
		0.61250	
1.00839		0.61061	
		0.94160	
3.69408	-5.46683		
	9.69809		
		0.57185	
	1.60778		
0.61242			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.50, B= 2.0, P= 1.0

6768.0389	-9523.2582	2666.8376	408.93527
	13411.345	-3747.9188	-581.34731
		1054.2407	158.35425
			28.42562
	11.23759	4.56891	-5.93746
		3.41594	-2.78016
			3.71713
5.67105		5.47893	-3.87348
		6.85165	-4.10839
			3.22571
		1.55834	-0.36614
			0.58002
21.92973	-42.41481		8.35780
	87.16204		-18.38394
			4.63972
	5.12654		-2.21893
			1.45442
1.28982			-0.58820
			0.76224
			0.49400
885.03468	-1159.9086	388.72955	
	1521.9063	-509.33301	
		172.07639	
	1.75352	0.12809	
		1.33657	
1.01973		0.54551	
		1.61904	
6.87434	-9.29874		
	14.31941		
		1.32721	
	1.74125		
0.83592			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.75, B= 2.0, P= 1.0

51918.722	-72077.218	22405.591	2156.4497
	100076.76	-31094.381	-3002.6631
		9686.9484	920.99749
			96.57751
	14.09896	10.63423	-8.92816
		17.78672	-9.62114
			7.00914
7.31439		10.81551	-6.12643
		25.75828	-11.94594
			6.48680
		9.76578	-2.88701
			1.35538
95.33070	-156.94140		26.21294
	266.11111		-46.32987
			9.01264
	7.74102		-3.17593
			1.80490
2.77312			-1.11051
			0.94662
			0.50191
3768.0150	-5031.6690	1840.9192	
	6721.8324	-2459.9169	
		903.98833	
	2.72637	-1.62107	
		4.58020	
1.52830		-0.46679	
		3.75890	
19.09126	-22.19256		
	27.95027		
		3.61633	
	2.15262		
1.47034			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.00, B= 2.0, P= 1.0

477.10463	-716.71104	158.56468	56.42411
	1084.5140	-236.82983	-88.62604
		53.23020	18.02885
			9.10256
	7.86401	1.36752	-3.86522
		0.53157	-0.72358
			2.42965
3.45957		2.05352	-2.14522
		1.51269	-1.32478
			1.86008
		0.29377	-0.05143
			0.52987
4.76452	-11.23094		2.71889
	30.81956		-8.41274
			2.99627
	4.34595		-2.00375
			1.44472
0.67186			-0.34679
			0.69986
			0.52086
127.34826	-167.34442	46.80915	
	221.61714	-61.29405	
		17.52164	
	1.71501	0.21641	
		0.31608	
0.98550		0.52565	
		0.56915	
2.29732	-3.59699		
	7.19876		
		0.28878	
	1.56684		
0.50002			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.25, B= 2.0, P= 1.0

2181.8275	-3151.1177	795.39857	185.90333
	4561.1730	-1146.0648	-273.67765
		291.28148	66.27925
			19.03261
	10.15204	2.69447	-5.18563
		1.31405	-1.49295
			3.19266
4.85621		3.63185	-3.16875
		3.31509	-2.48647
			2.61152
		0.59891	-0.11662
			0.54385
9.84283	-21.57333		4.91544
	51.91101		-12.89790
			3.95119
	4.62701		-2.12433
			1.49645
0.87733			-0.44470
			0.74656
			0.52114
365.99426	-477.93816	148.00802	
	625.85082	-193.00855	
		60.47034	
	1.72934	0.26957	
		0.61592	
1.01131		0.61483	
		0.94769	
3.72782	-5.52781		
	9.80830		
		0.57390	
	1.61136		
0.61243			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.50, B= 2.0, P= 1.0

8202.3200	-11597.070	3209.3847	532.59970
	16409.851	-4532.3804	-760.15548
		1259.4711	205.13186
			39.09022
	13.02333	5.29418	-7.12512
		3.71052	-3.26251
			4.50702
6.50960		6.28853	-4.61274
		7.63333	-4.82213
			3.87744
		1.55836	-0.36604
			0.60883
24.16480	-47.65669		9.88261
	99.45586		-21.96019
			5.68009
	5.46958		-2.47017
			1.63843
1.32894			-0.64015
			0.83121
			0.52286
945.71022	-1240.0387	414.48658	
	1627.7289	-543.34860	
		183.01037	
	1.75926	0.13650	
		1.34888	
1.02213		0.55197	
		1.63636	
6.97037	-9.44887		
	14.55412		
		1.33829	
	1.74545		
0.83594			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.75, B= 2.0, P= 1.0

70021.819	-97500.140	29963.357	3133.0366
	135779.23	-41708.045	-4374.1415
		12842.212	1328.6947
			149.27352
	17.58829	13.68544	-11.62262
		20.45523	-11.97731
			9.08981
9.07034		13.70855	-7.94011
		30.52515	-14.93412
			8.36011
		9.80660	-2.93375
			1.40939
111.53159	-187.23015		32.93571
	322.73886		-58.89907
			11.80268
	8.43213		-3.60928
			2.07664
2.91396			-1.23335
			1.05374
			0.53172
4263.8822	-5693.1945	2075.9638	
	7604.3592	-2773.4849	
		1015.4013	
	2.72709	-1.62927	
		4.67316	
1.52912		-0.47531	
		3.84751	
19.62358	-22.87067		
	28.81409		
		3.69977	
	2.15905		
1.47040			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.00, B= 1.0, P= 1.0

43.80615	-33.96717	20.90659
	27.02194	-16.42737
		10.59457
	0.68388	-0.21646
		0.61685
1.10866		0.25702
		0.60793
2.55055	-1.55055	
	1.55055	
		0.54834
	0.60793	
1.00000		

Q1= 0.000, Q2= 0.25, B= 1.0, P= 1.0

111.75924	-92.52257	65.09647
	77.52287	-54.57445
		39.43917
	0.92583	-0.68277
		1.52239
1.33471		-0.03745
		1.01992
4.31400	-2.44451	
	2.00479	
		1.01887
	0.61962	
1.33333		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.50, B= 1.0, P= 1.0

257.23033	-231.35980	178.96342
	210.14187	-163.40069
		128.77219
	2.05071	-2.43623
		4.26157
2.51024		-0.93577
		1.71618
8.51275	-4.27080	
	2.80062	
		1.36735
	0.65798	
2.00000		

Q1= 0.000, Q2= 0.75, B= 1.0, P= 1.0

918.49036	-962.49139	823.20532
	1020.2614	-877.83768
		759.03122
	11.66105	-15.19603
		21.22598
10.49786		-4.92678
		3.73557
25.68518	-10.43484	
	5.02121	
		1.42336
	0.78196	
4.00000		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.00, B= 1.0, P= 1.0

57.32347	-45.34167	26.69992	0.30716
	36.59410	-21.30185	-0.25908
		13.07778	0.13129
			0.00745
	0.72979	-0.18277	-0.01612
		0.64159	-0.01178
			0.00580
1.14320		0.30601	-0.01385
		0.67773	-0.01952
			0.00561
		0.59581	-0.01582
			0.00544
2.81225	-1.85128		0.03911
	1.89641		-0.04523
			0.00613
	0.67773		-0.01948
			0.00559
1.00503			-0.00504
			0.00505
			0.00503
44.65481	-34.65596	21.28494	
	27.58096	-16.73444	
		10.76325	
	0.68497	-0.21551	
		0.61768	
1.10900		0.25782	
		0.60981	
2.56263	-1.56264		
	1.56265		
		0.54987	
	0.60978		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.25, B= 1.0, P= 1.0

166.93362	-139.37841	94.28876	0.66645
	117.31496	-79.36437	-0.56657
		54.88646	0.35155
			0.00864
	0.94331	-0.63956	-0.01014
		1.62954	-0.02487
			0.00598
1.34228		-0.00169	-0.00668
		1.19592	-0.03174
			0.00590
		1.19592	-0.03175
			0.00587
4.95614	-3.03935		0.06252
	2.55617		-0.05824
			0.00639
	0.69229		-0.01990
			0.00560
1.34228			-0.00673
			0.00506
			0.00503
115.51177	-95.66253	67.16350	
	80.15025	-56.30405	
		40.57776	
	0.92612	-0.68175	
		1.52602	
1.33471		-0.03763	
		1.02522	
4.34409	-2.46920		
	2.02505		
		1.02416	
	0.62155		
1.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.50, B= 1.0, P= 1.0

443.74639	-397.40349	296.40762	1.32997
	357.96030	-267.95456	-1.18386
		202.73674	0.83431
			0.01024
	2.05987	-2.50243	0.00722
		4.74645	-0.05407
			0.00625
2.55352		-1.07251	0.01567
		2.15683	-0.05188
			0.00632
		1.70636	-0.04530
			0.00623
10.38894	-5.64532		0.11019
	3.80818		-0.08116
			0.00681
	0.74053		-0.02128
			0.00564
2.02020			-0.01013
			0.00508
			0.00503
270.99172	-243.62859	188.03657	
	221.07996	-171.48975	
		134.75430	
	2.05153	-2.43999	
		4.27890	
2.51469		-0.94395	
		1.73123	
8.60490	-4.33126		
	2.84029		
		1.37690	
	0.66016		
2.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.75, B= 1.0, P= 1.0

2125.6801	-2166.3120	1792.5512	4.02704
	2220.7809	-1844.5960	-4.00741
		1537.6304	3.21678
			0.01463
	13.06042	-17.78065	0.09660
		26.00134	-0.17915
			0.00700
12.50113		-6.80255	0.11791
		5.49613	-0.11180
			0.00740
		1.79449	-0.04764
			0.00629
35.94527	-15.90388		0.27695
	7.93800		-0.14844
			0.00790
	0.90137		-0.02591
			0.00577
4.08163			-0.02046
			0.00513
			0.00503
1017.4486	-1063.4812	907.29928	
	1123.3246	-963.65823	
		830.49390	
	11.72810	-15.30983	
		21.41912	
10.62270		-5.02154	
		3.80748	
26.24083	-10.70235		
	5.15000		
		1.43372	
	0.78504		
4.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.00, B= 1.0, P= 1.0

65.78210	-52.60308	30.24538	0.61077
	42.82784	-24.34545	-0.51979
		14.56389	0.25852
			0.01840
	0.76344	-0.15954	-0.03138
		0.65763	-0.02231
			0.01273
1.17262		0.34320	-0.02765
		0.72474	-0.03696
			0.01209
		0.62429	-0.02886
			0.01144
2.97039	-2.04397		0.07390
	2.13123		-0.08764
			0.01381
	0.72474		-0.03679
			0.01197
1.01010			-0.01015
			0.01020
			0.01010
45.50349	-35.34536	21.66224	
	28.14099	-17.04094	
		10.93099	
	0.68607	-0.21454	
		0.61853	
1.10936		0.25865	
		0.61175	
2.57483	-1.57486		
	1.57490		
		0.55144	
	0.61165		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.25, B= 1.0, P= 1.0

204.69086	-171.72755	113.79678	1.39887
	145.03069	-96.07808	-1.19416
		64.96584	0.72986
			0.02292
	0.95806	-0.60707	-0.02057
		1.70113	-0.04783
			0.01336
1.35217		0.03291	-0.01511
		1.31727	-0.06123
			0.01308
		1.31647	-0.06086
			0.01291
5.35984	-3.43332		0.12041
	2.94069		-0.11477
			0.01472
	0.74142		-0.03764
			0.01201
1.35135			-0.01358
			0.01024
			0.01010
119.30088	-98.83330	69.24448	
	82.80359	-58.04543	
		41.72064	
	0.92639	-0.68072	
		1.52984	
1.33472		-0.03781	
		1.03070	
4.37459	-2.49426		
	2.04565		
		1.02963	
	0.62349		
1.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.50, B= 1.0, P= 1.0

583.90778	-522.12038	382.18592	2.96584
	468.93455	-344.28088	-2.63946
		255.23414	1.83507
			0.02944
	2.06340	-2.53675	0.01254
		5.08150	-0.10616
			0.01437
2.56930		-1.14277	0.02701
		2.47110	-0.10276
			0.01458
		1.96281	-0.09075
			0.01430
11.62511	-6.59647		0.21801
	4.54007		-0.16417
			0.01624
	0.79702		-0.04046
			0.01215
2.04082			-0.02051
			0.01031
			0.01010
285.09426	-256.18977	197.29918	
	232.26824	-179.73999	
		140.83802	
	2.05246	-2.44413	
		4.29734	
2.51926		-0.95240	
		1.74685	
8.69898	-4.39306		
	2.88089		
		1.38680	
	0.66235		
2.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.75, B= 1.0, P= 1.0

3238.4370	-3260.0627	2653.4244	10.26435
	3295.8571	-2690.7801	-10.13693
		2203.6676	8.03957
			0.04982
	14.02433	-19.63665	0.19596
		29.57526	-0.37056
			0.01729
13.78000		-8.13269	0.23751
		6.88010	-0.23635
			0.01864
		2.08034	-0.09618
			0.01455
43.46282	-20.10868		0.58394
	10.29004		-0.32024
			0.02049
	0.98648		-0.05008
			0.01264
4.16667			-0.04188
			0.01052
			0.01010
1123.6451	-1171.5223	997.00934	
	1233.2423	-1054.9266	
		906.27708	
	11.80289	-15.43589	
		21.63159	
10.75398		-5.12137	
		3.88341	
26.81987	-10.98138		
	5.28446		
		1.44445	
	0.78814		
4.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.00, B= 1.0, P= 1.0

73.29993	-59.12752	33.35994	0.93731
	48.49020	-27.04844	-0.80321
		15.85424	0.39378
			0.03261
	0.79487	-0.13858	-0.04713
		0.67161	-0.03280
			0.02062
1.20156		0.37787	-0.04210
		0.76627	-0.05426
			0.01930
		0.64744	-0.04102
			0.01783
3.10508	-2.21311		0.10873
	2.34365		-0.13139
			0.02283
	0.76627		-0.05390
			0.01902
1.01523			-0.01534
			0.01546
			0.01523
46.35645	-36.03882	22.04053	
	28.70477	-17.34848	
		11.09876	
	0.68717	-0.21355	
		0.61942	
1.10973		0.25952	
		0.61374	
2.58715	-1.58724		
	1.58733		
		0.55305	
	0.61354		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.25, B= 1.0, P= 1.0

240.51804	-202.57776	132.07635	2.24519
	171.59537	-111.81826	-1.92296
		74.29245	1.16161
			0.04295
	0.97303	-0.57616	-0.03193
		1.76499	-0.07130
			0.02199
1.36386		0.06875	-0.02497
		1.42729	-0.09147
			0.02140
		1.42382	-0.09021
			0.02094
5.71405	-3.78840		0.18010
	3.29665		-0.17462
			0.02479
	0.78495		-0.05521
			0.01911
1.36054			-0.02056
			0.01554
			0.01523
123.15336	-102.05734	71.35480	
	85.50170	-59.81151	
		42.87664	
	0.92666	-0.67970	
		1.53381	
1.33472		-0.03797	
		1.03634	
4.40552	-2.51972		
	2.06660		
		1.03526	
	0.62546		
1.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.50, B= 1.0, P= 1.0

726.26590	-648.80812	467.99069	5.00667
	581.67685	-420.64048	-4.45565
		306.95275	3.06494
			0.05876
	2.06547	-2.56198	0.01705
		5.38926	-0.16126
			0.02425
2.57889		-1.19587	0.03679
		2.76596	-0.15717
			0.02463
		2.21142	-0.14011
			0.02411
12.75127	-7.48523		0.33376
	5.24152		-0.25554
			0.02816
	0.84754		-0.05961
			0.01942
2.06186			-0.03116
			0.01570
			0.01523
299.67798	-269.16916	206.84605	
	243.81980	-188.23663	
		147.08765	
	2.05349	-2.44861	
		4.31677	
2.52394		-0.96109	
		1.76300	
8.79504	-4.45624		
	2.92244		
		1.39703	
	0.66457		
2.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.75, B= 1.0, P= 1.0

4549.1094	-4538.8080	3646.9838	19.41918
	4543.4573	-3660.1461	-19.06793
		2956.8579	14.97762
			0.11393
	14.92725	-21.42079	0.30727
		33.10085	-0.59058
			0.03103
14.94582		-9.41693	0.37076
		8.29508	-0.38324
			0.03391
		2.36174	-0.14964
			0.02471
50.92548	-24.38978		0.94581
	12.74608		-0.52789
			0.03806
	1.06506		-0.07491
			0.02050
4.25532			-0.06431
			0.01620
			0.01523
1239.1636	-1288.7314	1094.0897	
	1352.1669	-1153.4279	
		987.86250	
	11.88492	-15.57345	
		21.86227	
10.89168		-5.22629	
		3.96335	
27.42379	-11.27267		
	5.42496		
		1.45555	
	0.79128		
4.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.00, B= 1.0, P= 1.0

80.40417	-65.34712	36.27638	1.29022
	53.93533	-29.60169	-1.11220
		17.05150	0.53864
			0.05016
	0.82558	-0.11869	-0.06359
		0.68449	-0.04347
			0.02945
1.23073		0.41147	-0.05730
		0.80500	-0.07177
			0.02722
		0.66743	-0.05261
			0.02456
3.22764	-2.37070		0.14427
	2.54627		-0.17710
			0.03314
	0.80500		-0.07113
			0.02669
1.02041			-0.02062
			0.02082
			0.02041
47.21577	-36.73797	22.42078	
	29.27361	-17.65786	
		11.26702	
	0.68827	-0.21255	
		0.62034	
1.11012		0.26041	
		0.61578	
2.59959	-1.59975		
	1.59991		
		0.55470	
	0.61545		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.25, B= 1.0, P= 1.0

276.33373	-233.54498	150.17110	3.21606
	198.37049	-127.46343	-2.76243
		83.43431	1.65206
			0.06930
	0.98866	-0.54549	-0.04436
		1.82516	-0.09568
			0.03187
1.37723		0.10622	-0.03620
		1.53238	-0.12294
			0.03083
		1.52419	-0.12015
			0.02988
6.04492	-4.12709		0.24256
	3.64334		-0.23856
			0.03659
	0.82563		-0.07296
			0.02685
1.36986			-0.02767
			0.02097
			0.02041
127.08252	-105.34583	73.50200	
	88.25398	-61.60859	
		44.05003	
	0.92692	-0.67866	
		1.53794	
1.33473		-0.03812	
		1.04213	
4.43689	-2.54556		
	2.08790		
		1.04104	
	0.62744		
1.33333			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.50, B= 1.0, P= 1.0

877.20515	-783.17097	557.88796	7.50314
	701.28375	-500.66506	-6.67796
		360.49481	4.55163
			0.10010
	2.06673	-2.58128	0.02086
		5.68730	-0.22024
			0.03593
2.58518		-1.23856	0.04541
		3.05675	-0.21594
			0.03651
		2.46336	-0.19419
			0.03572
13.83910	-8.36089		0.45921
	5.94640		-0.35653
			0.04263
	0.89517		-0.07910
			0.02740
2.08333			-0.04209
			0.02126
			0.02041
314.81956	-282.63520	216.72766	
	255.79569	-197.02474	
		153.53653	
	2.05462	-2.45341	
		4.33717	
2.52871		-0.97002	
		1.77967	
8.89317	-4.52085		
	2.96498		
		1.40757	
	0.66680		
2.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.75, B= 1.0, P= 1.0

6133.3336	-6075.8126	4828.9059	32.30481
	6034.6525	-4806.8461	-31.56884
		3838.6541	24.58957
			0.21889
	15.82143	-23.22772	0.43301
		36.75236	-0.84471
			0.04873
16.08015		-10.72590	0.52066
		9.80580	-0.55630
			0.05374
		2.65134	-0.20900
			0.03688
58.72227	-28.95180		1.37191
	15.41546		-0.77725
			0.06137
	1.14137		-0.10085
			0.02932
4.34783			-0.08784
			0.02218
			0.02041
1365.5721	-1416.6714	1199.8124	
	1481.6570	-1260.4315	
		1076.2846	
	11.97415	-15.72246	
		22.11111	
11.03600		-5.33647	
		4.04746	
28.05421	-11.57703		
	5.57190		
		1.46701	
	0.79445		
4.00001			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.00, B= 1.0, P= 1.0

87.30430	-71.43381	39.08714	1.67117
	59.30450	-32.08110	-1.44826
		18.19647	0.69382
			0.07121
	0.85619	-0.09936	-0.08088
		0.69670	-0.05439
			0.03922
1.26043		0.44463	-0.07329
		0.84202	-0.08963
			0.03584
		0.68517	-0.06377
			0.03158
3.34269	-2.52162		0.18081
	2.74424		-0.22503
			0.04475
	0.84202		-0.08864
			0.03497
1.02564			-0.02597
			0.02630
			0.02564
48.08283	-37.44395	22.80365	
	29.84843	-17.96961	
		11.43609	
	0.68938	-0.21152	
		0.62128	
1.11053		0.26133	
		0.61787	
2.61216	-1.61241		
	1.61266		
		0.55638	
	0.61737		
1.00000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.25, B= 1.0, P= 1.0

312.93474	-265.30515	168.50932	4.32084
	225.93009	-143.37620	-3.72112
		92.62236	2.20556
			0.10267
	1.00518	-0.51450	-0.05792
		1.88334	-0.12113
			0.04301
1.39226		0.14554	-0.04880
		1.63521	-0.15588
			0.04138
		1.62000	-0.15078
			0.03967
6.36308	-4.45856		0.30824
	3.98870		-0.30699
			0.05015
	0.86462		-0.09102
			0.03522
1.37931			-0.03492
			0.02653
			0.02564
131.09811	-108.70694	75.69148	
	91.06728	-63.44122	
		45.24383	
	0.92717	-0.67762	
		1.54221	
1.33473		-0.03825	
		1.04807	
4.46870	-2.57182		
	2.10956		
		1.04697	
	0.62943		
1.33334			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.50, B= 1.0, P= 1.0

1039.9531	-928.09986	653.84541	10.51158
	830.34457	-586.11623	-9.35702
		417.07248	6.32530
			0.15576
	2.06745	-2.59584	0.02397
		5.98296	-0.28361
			0.04951
2.58935		-1.27345	0.05297
		3.34998	-0.27956
			0.05032
		2.72369	-0.25351
			0.04924
14.91826	-9.24421		0.59540
	6.66943		-0.46802
			0.05983
	0.94119		-0.09908
			0.03607
2.10526			-0.05330
			0.02699
			0.02564
330.58187	-296.64370	226.98455	
	268.24554	-206.14040	
		160.21093	
	2.05584	-2.45852	
		4.35850	
2.53359		-0.97918	
		1.79687	
8.99341	-4.58693		
	3.00854		
		1.41844	
	0.66906		
2.00001			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.75, B= 1.0, P= 1.0

8064.1299	-7940.5447	6250.1675	49.97109
	7835.5834	-6179.4838	-48.63001
		4884.8604	37.59230
			0.38068
	16.72999	-25.10193	0.57525
		40.61869	-1.13819
			0.07102
17.21797		-12.09326	0.68965
		11.44923	-0.75946
			0.07887
		2.95537	-0.27507
			0.05124
67.05502	-33.90951		1.87183
	18.36519		-1.07471
			0.09138
	1.21726		-0.12814
			0.03913
4.44444			-0.11252
			0.02849
			0.02564
504.5135	-1556.9688	1315.4930	
	1623.3237	-1377.2411	
		1172.5986	
	12.07070	-15.88312	
		22.37847	
11.18725		-5.45215	
		4.13594	
28.71291	-11.89533		
	5.72571		
		1.47881	
	0.79765		
4.00002			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.00, B= 0.5, P= 2.0

5.52838	-4.90615	13.39857
	4.78711	-13.04921
		38.29685
	0.43315	-1.15867
		5.82407
0.50023		0.02487
		2.72591
0.84074	-0.34074	
	0.34074	
		2.72467
	0.20264	
0.50000		

Q1= 0.000, Q2= 0.25, B= 0.5, P= 2.0

13.21374	-15.49826	49.46582
	19.55439	-63.49033
		210.73480
	1.37665	-5.47239
		25.55885
0.93026		-0.85483
		4.59069
1.60262	-0.59516	
	0.42598	
		3.80517
	0.20495	
0.77108		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.000, Q2= 0.50, B= 0.5, P= 2.0

29.15564	-48.00419	168.64713
	86.68843	-310.04470
		1116.4180
	7.65049	-32.37055
		140.89997
2.57307		-3.04179
		7.53051
3.67965	-1.16855	
	0.58473	
		3.93460
	0.21364	
1.34439		

Q1= 0.000, Q2= 0.75, B= 0.5, P= 2.0

102.07881	-322.92842	1229.8409
	1159.9606	-4460.3100
		17166.665
	138.36990	-569.68291
		2349.5970
12.17682		-11.89165
		15.76785
13.97150	-3.38635	
	1.06544	
		4.15469
	0.24467	
3.20849		

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.00, B= 0.5, P= 2.0

6.40022	-5.83500	15.31971	0.06605
	5.77707	-15.09583	-0.07071
		42.53016	0.14543
			0.00530
	0.45738	-1.12905	-0.01049
		5.86059	-0.01267
			0.00462
0.50672		0.07251	-0.00537
		3.08388	-0.03933
			0.00444
		3.07351	-0.03857
			0.00438
0.88194	-0.39736		0.01367
	0.41890		-0.01909
			0.00481
	0.23987		-0.01293
			0.00459
0.50501			-0.00444
			0.00394
			0.00390
5.57746	-4.95423	13.50815	
	4.83421	-13.15656	
		38.54149	
	0.43357	-1.15781	
		5.82584	
0.50023		0.02495	
		2.73523	
0.84308	-0.34308		
	0.34308		
		2.73398	
	0.20347		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.25, B= 0.5, P= 2.0

16.68428	-19.68628	61.10623	0.13781
	24.60843	-77.53659	-0.16657
		249.77945	0.46142
			0.00581
	1.38000	-5.43553	-0.00396
		25.97770	-0.04332
			0.00467
0.93563		-0.92158	0.00456
		5.47607	-0.06340
			0.00468
		4.56832	-0.05890
			0.00466
1.73521	-0.71767		0.02493
	0.53951		-0.02333
			0.00495
	0.24268		-0.01302
			0.00460
0.78053			-0.00611
			0.00395
			0.00390
13.41373	-15.73337	50.15587	
	19.83078	-64.30155	
		213.11579	
	1.37665	-5.47224	
		25.57577	
0.93118		-0.85976	
		4.61718	
1.60977	-0.60027		
	0.42964		
		3.82335	
	0.20580		
0.77108			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.50, B= 0.5, P= 2.0

40.76916	-65.97255	227.26986	0.26622
	114.48937	-400.74973	-0.41149
		1412.3795	1.33958
			0.00650
	7.73277	-32.98225	0.01930
		145.45153	-0.14447
			0.00476
2.75361		-3.65534	0.02910
		9.62616	-0.10077
			0.00502
		4.77380	-0.06213
			0.00471
4.19854	-1.48681		0.05066
	0.78031		-0.03140
			0.00522
	0.25379		-0.01345
			0.00461
1.36557			-0.00916
			0.00396
			0.00390
29.85797	-49.10731	172.36607	
	88.42108	-315.88593	
		1136.1103	
	7.65443	-32.39596	
		141.06397	
2.58474		-3.07070	
		7.60207	
3.70728	-1.18238		
	0.59165		
		3.95404	
	0.21455		
1.34439			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.005, Q2= 0.75, B= 0.5, P= 2.0

178.24934	-529.44002	1994.4891	0.77229
	1720.0409	-6534.2734	-2.08344
		24846.635	7.70566
			0.00839
	147.48675	-610.19904	0.21042
		2529.6560	-0.93569
			0.00504
15.28418		-16.80371	0.13099
		23.54518	-0.20912
			0.00586
		5.07087	-0.06511
			0.00474
18.14771	-4.92082		0.15374
	1.62995		-0.05697
			0.00600
	0.29565		-0.01528
			0.00469
3.29172			-0.01826
			0.00400
			0.00390
107.12462	-337.56291	1284.8255	
	1202.4034	-4619.7745	
		17765.799	
	138.70090	-571.13062	
		2355.9289	
12.35715		-12.13076	
		16.08490	
14.20583	-3.46008		
	1.08864		
		4.17638	
	0.24588		
3.20849			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.00, B= 0.5, P= 2.0

6.93088	-6.42519	16.48071	0.12820
	6.43352	-16.38706	-0.13986
		45.07025	0.28139
			0.01261
	0.47712	-1.10882	-0.02102
		5.88134	-0.02345
			0.01024
0.51401		0.11485	-0.01148
		3.33012	-0.07486
			0.00957
		3.30446	-0.07230
			0.00932
0.90443	-0.43298		0.02530
	0.47536		-0.03755
			0.01086
	0.26807		-0.02544
			0.01015
0.51004			-0.00890
			0.00789
			0.00773
5.62781	-5.00356	13.62054	
	4.88253	-13.26666	
		38.79235	
	0.43398	-1.15695	
		5.82764	
0.50023		0.02504	
		2.74462	
0.84545	-0.34545		
	0.34545		
		2.74337	
	0.20430		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.25, B= 0.5, P= 2.0

18.97689	-22.49207	68.67541	0.27875
	28.04230	-86.79999	-0.33908
		274.76973	0.92663
			0.01451
	1.38391	-5.40351	-0.00870
		26.24051	-0.08212
			0.01041
0.93652		-0.94484	0.00678
		6.09562	-0.12292
			0.01041
		5.14239	-0.11608
			0.01036
1.81229	-0.79745		0.04715
	0.62210		-0.04635
			0.01138
	0.27121		-0.02561
			0.01016
0.79007			-0.01227
			0.00793
			0.00774
13.62143	-15.97751	50.87235	
	20.11777	-65.14376	
		215.58734	
	1.37665	-5.47209	
		25.59291	
0.93211		-0.86476	
		4.64400	
1.61703	-0.60548		
	0.43336		
		3.84173	
	0.20665		
0.77108			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.50, B= 0.5, P= 2.0

49.10955	-78.76807	268.21765	0.56491
	134.11985	-463.57083	-0.86968
		1613.4211	2.80551
			0.01724
	7.78170	-33.36960	0.03639
		148.51835	-0.27981
			0.01074
2.84936		-4.03572	0.05415
		11.13839	-0.20045
			0.01160
		5.42237	-0.12376
			0.01057
4.52062	-1.70333		0.09852
	0.92591		-0.06360
			0.01236
	0.28411		-0.02648
			0.01022
1.38712			-0.01848
			0.00799
			0.00775
30.60035	-50.27299	176.29531	
	90.25141	-322.05553	
		1156.9065	
	7.65844	-32.42183	
		141.23074	
2.59665		-3.10018	
		7.67504	
3.73557	-1.19653		
	0.59874		
		3.97370	
	0.21548		
1.34439			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.010, Q2= 0.75, B= 0.5, P= 2.0

243.83313	-699.95223	2619.7203	1.83244
	2163.3861	-8159.9493	-4.83816
		30807.750	17.80520
			0.02561
	154.08936	-639.72807	0.42209
		2661.7197	-1.88241
			0.01184
17.36726		-20.38844	0.26708
		29.71548	-0.44356
			0.01479
		5.78031	-0.13001
			0.01069
21.06663	-6.07536		0.31839
	2.08668		-0.12215
			0.01532
	0.33463		-0.03033
			0.01051
3.37831			-0.03725
			0.00817
			0.00776
112.73055	-353.80535	1345.8438	
	1249.4632	-4796.5649	
		18429.951	
	139.04341	-572.62778	
		2362.4732	
12.54494		-12.37977	
		16.41508	
14.45055	-3.53707		
	1.11286		
		4.19831	
	0.24709		
3.20849			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.00, B= 0.5, P= 2.0

7.39185	-6.95036	17.48518	0.19323
	7.03186	-17.53143	-0.21397
		47.25905	0.42308
			0.02180
	0.49661	-1.09057	-0.03228
		5.89843	-0.03399
			0.01675
0.52204		0.15692	-0.01826
		3.55067	-0.11037
			0.01529
		3.50350	-0.10488
			0.01465
0.92258	-0.46398		0.03669
	0.52832		-0.05702
			0.01802
	0.29497		-0.03857
			0.01656
0.51510			-0.01338
			0.01186
			0.01151
5.67942	-5.05412	13.73571	
	4.93206	-13.37949	
		39.04936	
	0.43440	-1.15607	
		5.82946	
0.50023		0.02512	
		2.75408	
0.84785	-0.34785		
	0.34785		
		2.75282	
	0.20514		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.25, B= 0.5, P= 2.0

21.09049	-25.09979	75.59092	0.43519
	31.25967	-95.33218	-0.53211
		297.39682	1.43845
			0.02611
	1.38841	-5.37143	-0.01419
		26.46960	-0.12132
			0.01713
0.93674		-0.95557	0.00793
		6.66352	-0.18432
			0.01705
		5.68874	-0.17623
			0.01699
1.87714	-0.86870		0.06957
	0.70041		-0.07101
			0.01915
	0.29839		-0.03881
			0.01657
0.79971			-0.01850
			0.01195
			0.01153
13.83697	-16.23084	51.61558	
	20.41551	-66.01730	
		218.15020	
	1.37665	-5.47194	
		25.61032	
0.93305		-0.86981	
		4.67115	
1.62443	-0.61077		
	0.43715		
		3.86029	
	0.20750		
0.77108			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.50, B= 0.5, P= 2.0

57.29581	-91.26811	307.76582	0.91941
	153.20686	-523.95934	-1.41095
		1804.4832	4.51778
			0.03262
	7.82330	-33.71047	0.05359
		151.31169	-0.42083
			0.01787
2.92573		-4.36630	0.07887
		12.57001	-0.30761
			0.01963
		6.05384	-0.18989
			0.01750
4.80444	-1.90359		0.14887
	1.06724		-0.09915
			0.02131
	0.31300		-0.04016
			0.01670
1.40906			-0.02797
			0.01210
			0.01155

31.38437	-51.50347	180.44201	
	92.18257	-328.56355	
		1178.8386	
	7.66256	-32.44834	
		141.40118	
2.60879		-3.13024	
		7.74948	
3.76454	-1.21103		
	0.60599		
		3.99356	
	0.21641		
1.34439			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.015, Q2= 0.75, B= 0.5, P= 2.0

317.76588	-887.42664	3302.9369	3.29457
	2638.7934	-9892.5037	-8.54458
		37121.815	
			0.05459
	160.47184	-668.37251	0.65618
		2790.2755	-2.93302
			0.02044
19.32416		-23.91366	0.42103
		36.06677	-0.72101
			0.02693
		6.47360	-0.19999
			0.01775
23.88499	-7.23490		0.50860
	2.56380		-0.20044
			0.02818
	0.37230		-0.04638
			0.01735
3.46848			-0.05703
			0.01251
			0.01157
118.94665	-371.78200	1413.3615	
	1301.4510	-4991.8238	
		19163.316	
	139.40183	-574.19316	
		2369.3098	
12.74069		-12.63935	
		16.75930	
14.70630	-3.61755		
	1.13819		
		4.22050	
	0.24832		
3.20849			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.00, B= 0.5, P= 2.0

7.81931	-7.44711	18.41358	0.26214
	7.60913	-18.61030	-0.29407
		49.27542	0.57275
			0.03293
	0.51651	-1.07322	-0.04440
		5.91357	-0.04456
			0.02414
0.53078		0.19955	-0.02566
		3.75863	-0.14647
			0.02156
		3.68361	-0.13682
			0.02032
0.93840	-0.49268		0.04811
	0.58041		-0.07775
			0.02627
	0.32174		-0.05249
			0.02380
0.52018			-0.01789
			0.01585
			0.01524
5.73230	-5.10592	13.85367	
	4.98282	-13.49506	
		39.31251	
	0.43483	-1.15519	
		5.83131	
0.50023		0.02521	
		2.76362	
0.85028	-0.35029		
	0.35029		
		2.76235	
	0.20598		
0.50000			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.25, B= 0.5, P= 2.0

23.15490	-27.66408	82.29556	0.60960
	34.44488	-103.66026	-0.74876
		319.17175	2.00484
			0.04086
	1.39351	-5.33848	-0.02045
		26.68249	-0.16175
			0.02481
0.93676		-0.95819	0.00824
		7.21106	-0.24853
			0.02458
		6.23096	-0.24010
			0.02451
1.93573	-0.93621		0.09267
	0.77821		-0.09763
			0.02827
	0.32542		-0.05281
			0.02383
0.80944			-0.02479
			0.01602
			0.01526
14.06050	-16.49351	52.38598	
	20.72417	-66.92259	
		220.80540	
	1.37665	-5.47181	
		25.62804	
0.93400		-0.87493	
		4.69866	
1.63195	-0.61615		
	0.44100		
		3.87906	
	0.20837		
0.77108			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.50, B= 0.5, P= 2.0

65.74654	-104.12381	348.05146	1.33813
	172.76364	-585.24426	-2.04791
		1996.5328	6.51360
			0.05339
	7.86117	-34.02984	0.07130
		154.00516	-0.57022
			0.02616
2.99163		-4.67242	0.10386
		13.99258	-0.42377
			0.02912
		6.69505	-0.26156
			0.02551
5.07145	-2.09937		0.20262
	1.21080		-0.13857
			0.03214
	0.34175		-0.05470
			0.02405
1.43141			-0.03764
			0.01629
			0.01530
32.21172	-52.80113	184.81382	
	94.21790	-335.42057	
		1201.9399	
	7.66683	-32.47563	
		141.57604	
2.62118		-3.16092	
		7.82545	
3.79421	-1.22588		
	0.61342		
		4.01365	
	0.21735		
1.34439			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.020, Q2= 0.75, B= 0.5, P= 2.0

404.28578	-1102.3406	4082.0158	5.26775
	3172.6588	-11827.825	-13.44479
		44137.585	49.07409
			0.09966
	166.97583	-697.64882	0.91846
		2922.0566	-4.11363
			0.03102
21.27741		-27.56321	0.59636
		42.88643	-1.04872
			0.04268
		7.18045	-0.27619
			0.02597
26.76508	-8.45738		0.72919
	3.08272		-0.29410
			0.04509
	0.41031		-0.06368
			0.02523
3.56247			-0.07766
			0.01704
			0.01534
125.83746	-391.66184	1488.0053	
	1358.8056	-5207.1768	
		19971.916	
	139.78080	-575.84637	
		2376.5219	
12.94494		-12.91022	
		17.11854	
14.97380	-3.70172		
	1.16467		
		4.24294	
	0.24956		
3.20849			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.00, B= 0.5, P= 2.0

8.22773	-7.93012	19.29805	0.33543
	8.18039	-19.65633	-0.38075
		51.19087	0.73146
			0.04609
	0.53710	-1.05630	-0.05746
		5.92748	-0.05528
			0.03241
0.54021		0.24307	-0.03368
		3.95946	-0.18343
			0.02837
		3.85009	-0.16828
			0.02627
0.95270	-0.52004		0.05968
	0.63273		-0.09988
			0.03564
	0.34887		-0.06731
			0.03190
0.52529			-0.02241
			0.01987
			0.01891
5.78646	-5.15899	13.97444	
	5.03481	-13.61337	
		39.58179	
	0.43525	-1.15430	
		5.83318	
0.50023		0.02530	
		2.77324	
0.85275	-0.35275		
	0.35276		
		2.77196	
	0.20683		
0.50000			

AD-A058 263 AEROSPACE RESEARCH LABS WRIGHT-PATTERSON AFB OHIO F/G 12/1
ORDER STATISTICS AND THEIR USE IN TESTING AND ESTIMATION. VOLUM--ETC(U)
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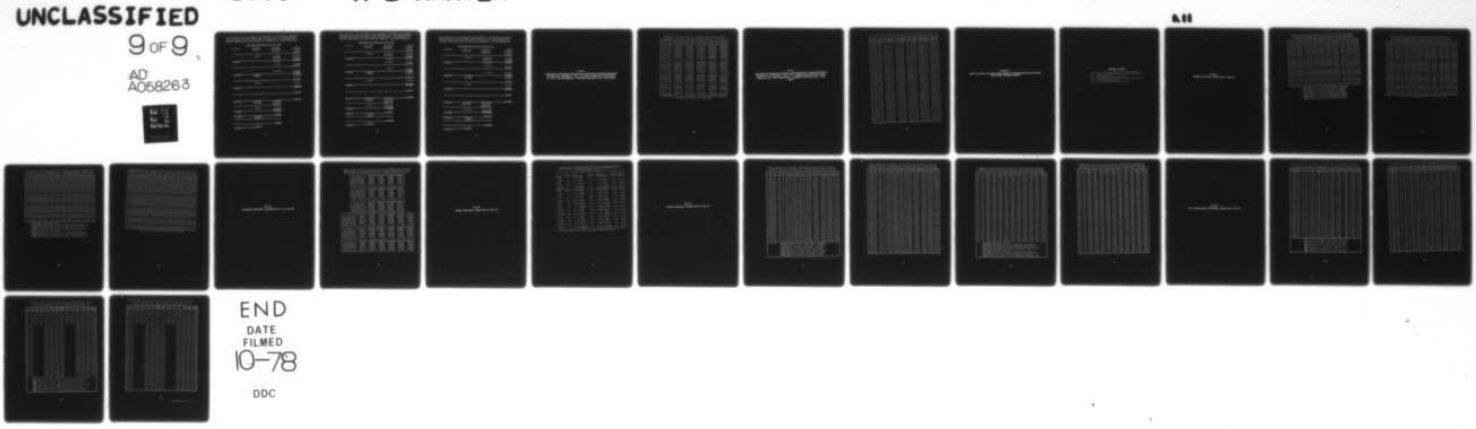

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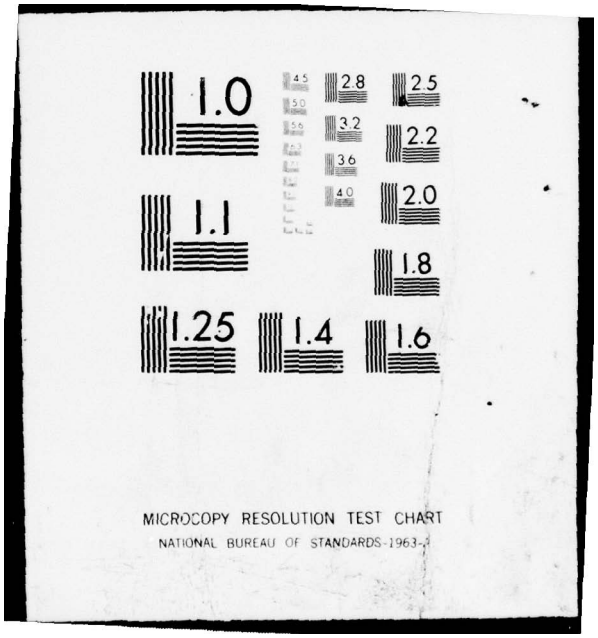
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.25, B= 0.5, P= 2.0

25.22315	-30.24875	88.96886	0.80371
	37.67493	-111.99979	-0.99136
		340.70355	2.63114
			0.05909
	1.39925	-5.30428	-0.02751
		26.88629	-0.20378
			0.03348
0.93679		-0.95443	0.00776
		7.75123	-0.31597
			0.03301
		6.77883	-0.30806
			0.03294
1.99046	-1.00193		0.11664
	0.85713		-0.12642
			0.03877
	0.35279		-0.06771
			0.03194
0.81927			-0.03114
			0.02013
			0.01894
14.29215	-16.76565	53.18383	
	21.04389	-67.85991	
		223.55334	
	1.37665	-5.47170	
		25.64610	
0.93496		-0.88011	
		4.72652	
1.63960	-0.62163		
	0.44492		
		3.89804	
	0.20924		
0.77108			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.50, B= 0.5, P= 2.0

74.65553	-117.63339	390.02325	1.82932
	193.24957	-648.89037	-2.79275
		2194.2708	8.82753
			0.08050
	7.89673	-34.33768	0.08969
		156.67041	-0.72942
			0.03567
3.05064		-4.96430	0.12935
		15.43684	-0.54990
			0.04014
		7.35843	-0.33942
			0.03465
5.33039	-2.29560		0.26026
	1.35952		-0.18226
			0.04498
	0.37089		-0.07018
			0.03228
1.45418			-0.04750
			0.02055
			0.01900
33.08373	-54.16763	189.41561	
	96.35932	-342.63192	
		1226.2246	
	7.67123	-32.50378	
		141.75569	
2.63382		-3.19223	
		7.90301	
3.82459	-1.24108		
	0.62104		
		4.03398	
	0.21830		
1.34439			

COEFFICIENTS OF 1/N TIMES POWER OF SCALE PARAMETER A IN ASYMPTOTIC VARIANCES AND COVARIANCES OF ML ESTIMATORS, FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, OF PARAMETERS OF FOUR-PARAMETER GENERALIZED GAMMA POPULATION WITH SHAPE/POWER PARAMETER B AND POWER PARAMETER P

Q1= 0.025, Q2= 0.75, B= 0.5, P= 2.0

506.94866	-1352.7476	4985.3573	7.88851
	3783.4478	-14031.259	-19.83615
		52086.534	72.12995
			0.16662
	173.76073	-728.27422	1.21364
		3060.2925	-5.44606
			0.04387
23.28241		-31.42950	0.79622
		50.34243	-1.43422
			0.06262
		7.91497	-0.35937
			0.03539
29.78526	-9.77404		0.98474
	3.65676		-0.40553
			0.06673
	0.44941		-0.08238
			0.03418
3.66052			-0.09918
			0.02176
			0.01907
133.46858	-413.60882	1570.3789	
	1421.9253	-5444.0839	
		20861.099	
	140.18353	-577.60123	
		2384.1686	
13.15828		-13.19318	
		17.49383	
15.25383	-3.78985		
	1.19241		
		4.26566	
	0.25081		
3.20849			

Table F6

COEFFICIENTS IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS μ AND σ OF LOGISTIC DISTRIBUTION FROM SAMPLES OF SIZE n WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

COEFFICIENTS OF σ^2/N IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS μ AND σ OF LOGISTIC DISTRIBUTION FROM SAMPLES OF SIZE N WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	N VAR$(\hat{\mu})/\sigma^2$	N VAR$(\hat{\sigma})/\sigma^2$	N COV$(\hat{\mu},\hat{\sigma})/\sigma^2$	N VAR$(\hat{\mu}\|\sigma)/\sigma^2$	N VAR$(\hat{\sigma}\|\mu)/\sigma^2$
0.0	0.0	0.911891	0.699322	0.000000	0.911891	0.699322
0.0	0.1	0.912876	0.769054	0.007452	0.912803	0.768994
0.0	0.2	0.920737	0.876663	0.036169	0.919245	0.875242
0.0	0.3	0.946701	1.029899	0.098945	0.937195	1.019557
0.0	0.4	1.012343	1.246821	0.217955	0.974242	1.199896
0.0	0.5	1.163950	1.562093	0.436172	1.042161	1.398644
0.0	0.6	1.513872	2.046448	0.847222	1.163126	1.572310
0.0	0.7	2.386396	2.866066	1.691620	1.387961	1.666944
0.0	0.8	5.025345	4.520589	3.777594	1.868628	1.680940
0.0	0.9	18.049503	9.509748	11.817224	3.364910	1.772871
0.1	0.1	0.913718	0.854083	0.000000	0.913718	0.854083
0.1	0.2	0.921155	0.988235	0.031160	0.920172	0.987181
0.1	0.3	0.946972	1.185761	0.102228	0.938159	1.174725
0.1	0.4	1.015380	1.479166	0.243534	0.975284	1.420756
0.1	0.5	1.182939	1.936695	0.519938	1.043353	1.708167
0.1	0.6	1.604612	2.720513	1.094087	1.164611	1.974522
0.1	0.7	2.825894	4.322156	2.491149	1.390077	2.126099
0.1	0.8	8.034268	9.220459	7.537549	1.872465	2.148919
0.2	0.2	0.926718	1.169419	0.000000	0.926718	1.169419
0.2	0.3	0.949261	1.448721	0.078894	0.944964	1.442164
0.2	0.4	1.015735	1.893218	0.250308	0.982641	1.831535
0.2	0.5	1.198442	2.664977	0.625186	1.051777	2.338839
0.2	0.6	1.743912	4.257226	1.556113	1.175117	2.868688
0.2	0.7	4.020561	9.157141	4.893916	1.405070	3.200158
0.3	0.3	0.963944	1.880831	0.000000	0.963944	1.880831
0.3	0.4	1.018918	2.643180	0.203958	1.003180	2.602354
0.3	0.5	1.209178	4.229832	0.752396	1.075343	3.761663
0.3	0.6	2.055657	9.132028	2.787791	1.204611	5.351351
0.4	0.4	1.045746	4.221988	0.000000	1.045746	4.221988
0.4	0.5	1.214726	9.122277	0.907717	1.124403	8.443975

(INTERCHANGING Q1 AND Q2 LEAVES VARIANCES AND ABSOLUTE VALUE OF COVARIANCE UNCHANGED, BUT CHANGES SIGN OF COVARIANCE)

Table F7

COEFFICIENTS IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS u AND b TYPE I EXTREME-VALUE DISTRIBUTION FROM SAMPLES OF SIZE n WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

COEFFICIENTS OF b^2/n IN ASYMPTOTIC VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS **u** AND **b** OF TYPE I EXTREME-VALUE DISTRIBUTION FROM SAMPLES OF SIZE **n** WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

q_1	q_2	$n\ \mathrm{VAR}(\hat{u})/b^2$	$n\ \mathrm{VAR}(\hat{b})/b^2$	$n\ \mathrm{COV}(\hat{u},\hat{b})/b^2$	$n\ \mathrm{VAR}(\hat{u}\|b)/b^2$	$n\ \mathrm{VAR}(\hat{b}\|u)/b^2$
0.0	0.0	1.103665	0.607927	-0.257022	1.000000	0.548342
0.0	0.1	1.151684	0.767044	-0.176413	1.111111	0.740022
0.0	0.2	1.252617	0.928191	-0.049288	1.250000	0.926252
0.0	0.3	1.447258	1.122447	0.144825	1.428571	1.107954
0.0	0.4	1.811959	1.372781	0.446603	1.666667	1.262704
0.0	0.5	2.510236	1.716182	0.935766	2.000000	1.367347
0.0	0.6	3.933022	2.224740	1.785525	2.500000	1.414141
0.0	0.7	7.190427	3.065515	3.438601	3.333333	1.421110
0.0	0.8	16.478771	4.738764	7.375310	5.000000	1.437839
0.0	0.9	60.517110	9.744662	22.187207	10.000000	1.610233
0.1	0.0	1.118727	0.654702	-0.278694	1.000092	0.585275
0.1	0.1	1.157024	0.842250	-0.196403	1.111225	0.808911
0.1	0.2	1.253484	1.039534	-0.058920	1.250144	1.036765
0.1	0.3	1.448869	1.287741	0.160918	1.428760	1.269869
0.1	0.4	1.834013	1.625480	0.521153	1.666924	1.477389
0.1	0.5	2.619087	2.124585	1.146524	2.000370	1.622686
0.1	0.6	4.368319	2.950577	2.347534	2.500578	1.689013
0.1	0.7	9.027691	4.599896	5.117492	3.334361	1.698963
0.1	0.8	27.763083	9.562344	14.752841	5.002312	1.722929
0.2	0.0	1.137715	0.721168	-0.314194	1.000829	0.634399
0.2	0.1	1.168880	0.952080	-0.232437	1.112134	0.905859
0.2	0.2	1.257014	1.207078	-0.083088	1.251295	1.201586
0.2	0.3	1.449409	1.546735	0.172088	1.430263	1.526303
0.2	0.4	1.859086	2.045511	0.623606	1.668969	1.836330
0.2	0.5	2.782556	2.870038	1.495475	2.003317	2.066300
0.2	0.6	5.203882	4.518143	3.491862	2.505185	2.175065
0.2	0.7	14.464850	9.484080	10.270575	3.342557	2.191594
0.3	0.0	1.171354	0.813416	-0.369870	1.003170	0.696625
0.3	0.1	1.192915	1.110818	-0.294142	1.115026	1.038290
0.3	0.2	1.267204	1.460390	-0.133736	1.254958	1.446276
0.3	0.3	1.449526	1.963716	0.168598	1.435050	1.944106
0.3	0.4	1.888035	2.790888	0.770185	1.675492	2.476707
0.3	0.5	3.067689	4.441586	2.164654	2.012722	2.914141
0.3	0.6	7.565384	9.412787	6.891442	2.519909	3.135250
0.4	0.0	1.230645	0.942493	-0.457647	1.008660	0.773305
0.4	0.1	1.241015	1.347812	-0.400827	1.121813	1.218351
0.4	0.2	1.293682	1.864610	-0.236991	1.263561	1.821195
0.4	0.3	1.452168	2.698811	0.125731	1.446311	2.687925
0.4	0.4	1.924836	4.354570	1.009384	1.690862	3.825249
0.4	0.5	3.813216	9.331397	4.073545	2.034943	4.979750
0.5	0.0	1.338098	1.134038	-0.600672	1.019937	0.864396
0.5	0.1	1.340734	1.724529	-0.594519	1.135779	1.460903
0.5	0.2	1.363071	2.576961	-0.459023	1.281307	2.422382
0.5	0.3	1.469964	4.242607	-0.038779	1.469609	4.241584
0.5	0.4	1.089349	9.226891	1.568276	1.722792	7.990561
0.6	0.0	1.545203	1.431430	-0.848735	1.041964	0.965244
0.6	0.1	1.566598	2.389556	-0.981853	1.163162	1.774183
0.6	0.2	1.568133	4.080712	-1.013806	1.316264	3.425281
0.6	0.3	1.581070	9.078796	-0.769896	1.515781	8.703898
0.7	0.0	1.991079	1.946111	-1.327539	1.085498	1.060983
0.7	0.1	2.178199	3.804751	-1.911687	1.217677	2.126964
0.7	0.2	2.432859	8.841320	-3.041565	1.386509	5.038750
0.8	0.0	3.170376	3.016820	-2.450529	1.179840	1.122695
0.8	0.1	4.683862	8.369955	-5.292215	1.337663	2.390373
0.9	0.0	8.177861	6.388191	-6.555257	1.451169	1.133590

Appendix G

TABLES OF RESULTS OF MONTE CARLO STUDIES OF MAXIMUM-LIKELIHOOD ESTIMATORS FROM DOUBLY CENSORED SAMPLES

SOURCES OF TABLES

Table G1 *Biometrika* 53(1966), 205–213; corrigendum, 56(1969), 229 (Harter and Moore)

Table G2 *J. Amer. Statist. Assoc.* 61(1966), 842–851; corrigenda, 61(1966), 1247 and 62(1967), 1519–1520 (Harter and Moore)

Table G3 *Ann. Math. Statist.* 38(1967), 557–570 (Harter and Moore)

Table G4 *J. Amer. Statist. Assoc.* 62(1967), 675–684 (Harter and Moore) [with additional values not previously published (Harter and Moore)]

Table G5 *J. Amer. Statist. Assoc.* 63(1968), 889–901 (Harter and Moore)

Table G1

NORMAL POPULATION — SAMPLE SIZES 10 AND 20

A. MEANS, VARIANCES, AND COVARIANCES OF ML ESTIMATES OF MEAN AND STANDARD DEVIATION OF STANDARD NORMAL POPULATION ($\mu=0$, $\sigma=1$) FROM 1000 SAMPLES OF SIZE N=10 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$M(\hat{\mu})$	$M(\hat{\sigma})$	$V(\hat{\mu})$	$C(\hat{\mu},\hat{\sigma})$	$V(\hat{\sigma})$	$M(\hat{\mu}\|\sigma)$	$M(\hat{\sigma}\|\mu)$	$V(\hat{\mu}\|\sigma)$	$V(\hat{\sigma}\|\mu)$
0.0	0.0	-0.00	0.93	0.100	0.000	0.049	-0.00	0.98	0.100	0.048
0.0	0.1	-0.01	0.92	0.101	0.003	0.057	-0.00	0.98	0.101	0.057
0.0	0.2	-0.02	0.90	0.104	0.009	0.067	-0.00	0.97	0.103	0.067
0.0	0.3	-0.04	0.88	0.114	0.019	0.078	-0.01	0.97	0.109	0.077
0.0	0.4	-0.07	0.85	0.125	0.028	0.084	-0.01	0.96	0.116	0.081
0.0	0.5	-0.1[illegible]	0.81	0.146	0.047	0.101	-0.02	0.95	0.124	0.091
0.0	0.6	-0.19	0.76	0.184	0.075	0.123	-0.03	0.94	0.138	0.101
0.0	0.7	-0.31	0.67	0.265	0.130	0.160	-0.03	0.93	0.160	0.105
0.0	0.8	-0.57	0.51	0.412	0.210	0.204	-0.05	0.93	0.197	0.108
0.1	0.1	-0.00	0.90	0.101	0.000	0.067	-0.00	0.97	0.101	0.067
0.1	0.2	-0.01	0.88	0.105	0.007	0.078	-0.00	0.97	0.104	0.079
0.1	0.3	-0.03	0.86	0.114	0.018	0.091	-0.01	0.96	0.111	0.093
0.1	0.4	-0.07	0.81	0.126	0.029	0.101	-0.01	0.95	0.117	0.101
0.1	0.5	-0.12	0.75	0.147	0.052	0.125	-0.02	0.93	0.126	0.117
0.1	0.6	-0.22	0.66	0.187	0.085	0.152	-0.03	0.92	0.140	0.134
0.1	0.7	-0.41	0.49	0.271	0.143	0.189	-0.04	0.90	0.163	0.139
0.2	0.2	-0.01	0.87	0.108	-0.001	0.096	-0.00	0.97	0.108	0.100
0.2	0.3	-0.03	0.83	0.116	0.011	0.114	-0.01	0.96	0.115	0.122
0.2	0.4	-0.06	0.77	0.127	0.024	0.129	-0.02	0.95	0.122	0.137
0.2	0.5	-0.13	0.68	0.147	0.051	0.164	-0.02	0.92	0.131	0.169
0.2	0.6	-0.27	0.49	0.184	0.084	0.188	-0.03	0.89	0.146	0.206
0.3	0.3	-0.01	0.79	0.119	0.003	0.145	-0.01	0.96	0.119	0.157
0.3	0.4	-0.05	0.69	0.127	0.020	0.176	-0.02	0.94	0.125	0.196
0.3	0.5	-0.13	0.52	0.148	0.050	0.217	-0.02	0.90	0.136	0.256
0.4	0.4	-0.01	0.51	0.134	0.000	0.218	-0.01	0.90	0.134	0.282

$M(\hat{\mu})$ = MEAN VALUE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ UNKNOWN)
$M(\hat{\sigma})$ = MEAN VALUE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ UNKNOWN)
$V(\hat{\mu})$ = VARIANCE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ UNKNOWN)
$C(\hat{\mu},\hat{\sigma})$ = COVARIANCE OF MLES $\hat{\mu}$ AND $\hat{\sigma}$ IN 1000 SAMPLES
$V(\hat{\sigma})$ = VARIANCE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ UNKNOWN)
$M(\hat{\mu}|\sigma)$ = MEAN VALUE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ KNOWN)
$M(\hat{\sigma}|\mu)$ = MEAN VALUE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ KNOWN)
$V(\hat{\mu}|\sigma)$ = VARIANCE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ KNOWN)
$V(\hat{\sigma}|\mu)$ = VARIANCE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ KNOWN)

B. MEANS, VARIANCES, AND COVARIANCES OF ML ESTIMATES OF MEAN AND STANDARD DEVIATION OF STANDARD NORMAL POPULATION ($\mu=0$, $\sigma=1$) FROM 1000 SAMPLES OF SIZE N=20 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$M(\hat{\mu})$	$M(\hat{\sigma})$	$V(\hat{\mu})$	$C(\hat{\mu},\hat{\sigma})$	$V(\hat{\sigma})$	$M(\hat{\mu}\mid\sigma)$	$M(\hat{\sigma}\mid\mu)$	$V(\hat{\mu}\mid\sigma)$	$V(\hat{\sigma}\mid\mu)$
0.0	0.0	0.01	0.97	0.048	0.000	0.023	0.01	0.99	0.048	0.022
0.0	0.1	0.01	0.96	0.048	0.002	0.027	0.01	0.99	0.048	0.027
0.0	0.2	-0.00	0.95	0.050	0.005	0.032	0.01	0.99	0.049	0.031
0.0	0.3	-0.01	0.94	0.054	0.010	0.038	0.00	0.98	0.052	0.036
0.0	0.4	-0.03	0.93	0.061	0.017	0.045	-0.00	0.97	0.055	0.040
0.0	0.5	-0.04	0.91	0.073	0.029	0.057	-0.00	0.97	0.059	0.046
0.0	0.6	-0.07	0.89	0.095	0.048	0.075	-0.00	0.97	0.064	0.052
0.0	0.7	-0.13	0.85	0.142	0.083	0.100	-0.00	0.96	0.074	0.055
0.0	0.8	-0.27	0.76	0.257	0.151	0.141	-0.02	0.96	0.095	0.055
0.0	0.9	-0.73	0.52	0.563	0.289	0.202	-0.05	0.97	0.150	0.059
0.1	0.1	0.01	0.96	0.049	-0.001	0.033	0.01	0.99	0.049	0.033
0.1	0.2	0.00	0.94	0.051	0.002	0.039	0.01	0.98	0.051	0.038
0.1	0.3	-0.01	0.92	0.054	0.008	0.048	0.00	0.98	0.053	0.045
0.1	0.4	-0.03	0.90	0.061	0.015	0.057	0.00	0.97	0.056	0.052
0.1	0.5	-0.05	0.88	0.074	0.031	0.076	0.00	0.96	0.061	0.063
0.1	0.6	-0.09	0.84	0.097	0.056	0.104	0.00	0.95	0.066	0.073
0.1	0.7	-0.18	0.76	0.152	0.104	0.146	-0.00	0.94	0.077	0.079
0.1	0.8	-0.51	0.49	0.274	0.183	0.193	-0.02	0.93	0.100	0.080
0.2	0.2	0.01	0.93	0.052	-0.001	0.048	0.01	0.98	0.052	0.047
0.2	0.3	-0.00	0.91	0.055	0.006	0.063	0.00	0.97	0.054	0.060
0.2	0.4	-0.02	0.87	0.061	0.014	0.076	0.00	0.96	0.058	0.070
0.2	0.5	-0.05	0.83	0.074	0.034	0.108	0.00	0.96	0.063	0.092
0.2	0.6	-0.11	0.75	0.101	0.072	0.160	0.00	0.94	0.069	0.116
0.2	0.7	-0.31	0.51	0.168	0.143	0.233	-0.00	0.91	0.081	0.133
0.3	0.3	0.01	0.88	0.057	-0.001	0.078	0.01	0.97	0.057	0.075
0.3	0.4	-0.02	0.83	0.062	0.009	0.101	0.00	0.96	0.061	0.095
0.3	0.5	-0.06	0.74	0.074	0.032	0.145	0.00	0.94	0.067	0.137
0.3	0.6	-0.18	0.50	0.098	0.073	0.214	0.00	0.89	0.073	0.190
0.4	0.4	0.00	0.74	0.064	-0.000	0.152	0.00	0.94	0.064	0.148
0.4	0.5	-0.06	0.49	0.074	0.029	0.220	0.00	0.90	0.070	0.258

SEE GLOSSARY OF COLUMN HEADINGS AT FOOT OF TABLE G1A

C. COMPARISON OF MEASURES OF PRECISION OF BEST LINEAR UNBIASED ESTIMATORS (BLUE) AND MAXIMUM-LIKELIHOOD ESTIMATORS (MLE) OF PARAMETERS OF NORMAL POPULATION FROM SAMPLES OF SIZE N=10 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$V(\mu^*)$	$MSE(\hat{\mu})$	$AV(\hat{\mu})$	$MSE(\hat{\mu}\|\sigma)$	$AV(\hat{\mu}\|\sigma)$	$V(\sigma^*)$	$MSE(\hat{\sigma})$	$AV(\hat{\sigma})$	$MSE(\hat{\sigma}\|\mu)$	$AV(\hat{\sigma}\|\mu)$
0.0	0.0	0.100	0.100	0.100	0.100	0.100	0.058	0.053	0.050	0.049	0.050
0.0	0.1	0.102	0.101	0.102	0.101	0.102	0.068	0.064	0.059	0.057	0.058
0.0	0.2	0.107	0.105	0.106	0.103	0.105	0.081	0.076	0.069	0.068	0.068
0.0	0.3	0.117	0.115	0.114	0.109	0.109	0.099	0.092	0.082	0.078	0.078
0.0	0.4	0.134	0.130	0.127	0.116	0.114	0.124	0.106	0.099	0.082	0.089
0.0	0.5	0.166	0.159	0.152	0.125	0.122	0.161	0.136	0.124	0.094	0.100
0.0	0.6	0.237	0.220	0.199	0.139	0.134	0.225	0.184	0.161	0.105	0.109
0.0	0.7	0.417	0.359	0.302	0.161	0.153	0.354	0.269	0.225	0.110	0.114
0.0	0.8	1.127	0.733	0.578	0.199	0.187	0.749	0.444	0.354	0.114	0.115
0.1	0.1	0.104	0.101	0.103	0.101	0.103	0.082	0.076	0.070	0.068	0.070
0.1	0.2	0.108	0.105	0.107	0.104	0.106	0.101	0.091	0.085	0.080	0.084
0.1	0.3	0.117	0.115	0.114	0.111	0.111	0.128	0.112	0.104	0.094	0.101
0.1	0.4	0.134	0.130	0.127	0.117	0.116	0.168	0.136	0.132	0.103	0.120
0.1	0.5	0.171	0.162	0.154	0.126	0.125	0.237	0.185	0.174	0.122	0.140
0.1	0.6	0.267	0.237	0.213	0.141	0.137	0.377	0.271	0.246	0.141	0.158
0.1	0.7	0.630	0.440	0.367	0.164	0.157	0.807	0.453	0.395	0.148	0.169
0.2	0.2	0.111	0.108	0.110	0.108	0.110	0.129	0.114	0.105	0.101	0.105
0.2	0.3	0.118	0.117	0.115	0.115	0.114	0.171	0.144	0.134	0.123	0.133
0.2	0.4	0.134	0.131	0.128	0.122	0.120	0.243	0.183	0.178	0.140	0.168
0.2	0.5	0.177	0.164	0.156	0.132	0.129	0.388	0.269	0.254	0.175	0.210
0.2	0.6	0.340	0.256	0.230	0.147	0.142	0.832	0.448	0.409	0.219	0.253
0.3	0.3	0.122	0.119	0.119	0.119	0.119	0.244	0.191	0.180	0.159	0.180
0.3	0.4	0.134	0.130	0.128	0.125	0.126	0.392	0.272	0.257	0.200	0.251
0.3	0.5	0.187	0.165	0.156	0.136	0.135	0.843	0.450	0.416	0.266	0.359
0.4	0.4	0.138	0.134	0.133	0.134	0.133	0.846	0.457	0.417	0.292	0.417

$V(\mu^*)$=EXACT VARIANCE OF BLUE μ^*
$MSE(\hat{\mu})$=MEAN SQUARE ERROR OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ UNKNOWN)
$AV(\hat{\mu})$=VARIANCE OF MLE $\hat{\mu}$ AS GIVEN BY ASYMPTOTIC FORMULA (σ UNKNOWN)
$MSE(\hat{\mu}|\sigma)$=MEAN SQUARE ERROR OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ KNOWN)
$AV(\hat{\mu}|\sigma)$=VARIANCE OF MLE $\hat{\mu}$ AS GIVEN BY ASYMPTOTIC FORMULA (σ KNOWN)
$V(\sigma^*)$=EXACT VARIANCE OF BLUE σ^*
$MSE(\hat{\sigma})$=MEAN SQUARE ERROR OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ UNKNOWN)
$AV(\hat{\sigma})$=VARIANCE OF MLE $\hat{\sigma}$ AS GIVEN BY ASYMPTOTIC FORMULA (μ UNKNOWN)
$MSE(\hat{\sigma}|\mu)$=MEAN SQUARE ERROR OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ KNOWN)
$AV(\hat{\sigma}|\mu)$=VARIANCE OF MLE $\hat{\sigma}$ AS GIVEN BY ASYMPTOTIC FORMULA (μ KNOWN)

D. COMPARISON OF MEASURES OF PRECISION OF BEST LINEAR UNBIASED ESTIMATORS (BLUE) AND MAXIMUM-LIKELIHOOD ESTIMATORS (MLE) OF PARAMETERS OF NORMAL POPULATION FROM SAMPLES OF SIZE N=20 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$V(\mu^*)$	$MSE(\hat{\mu})$	$AV(\hat{\mu})$	$MSE(\hat{\mu}\|\sigma)$	$AV(\hat{\mu}\|\sigma)$	$V(\sigma^*)$	$MSE(\hat{\sigma})$	$AV(\hat{\sigma})$	$MSE(\hat{\sigma}\|\mu)$	$AV(\hat{\sigma}\|\mu)$
0.0	0.0	0.050	0.048	0.050	0.048	0.050	0.027	0.024	0.025	0.022	0.025
0.0	0.1	0.051	0.048	0.051	0.048	0.051	0.032	0.029	0.029	0.027	0.029
0.0	0.2	0.053	0.050	0.053	0.049	0.052	0.037	0.034	0.034	0.031	0.034
0.0	0.3	0.058	0.054	0.057	0.052	0.054	0.045	0.042	0.041	0.036	0.039
0.0	0.4	0.065	0.061	0.064	0.055	0.057	0.055	0.050	0.050	0.041	0.045
0.0	0.5	0.079	0.075	0.076	0.059	0.061	0.070	0.065	0.062	0.047	0.050
0.0	0.6	0.108	0.100	0.099	0.064	0.067	0.094	0.087	0.081	0.053	0.054
0.0	0.7	0.175	0.158	0.151	0.074	0.076	0.139	0.122	0.112	0.056	0.057
0.0	0.8	0.383	0.331	0.289	0.095	0.094	0.244	0.198	0.177	0.057	0.057
0.0	0.9	1.871	1.089	0.890	0.152	0.139	0.786	0.430	0.376	0.060	0.059
0.1	0.1	0.052	0.049	0.052	0.049	0.052	0.038	0.035	0.035	0.033	0.035
0.1	0.2	0.054	0.051	0.053	0.051	0.053	0.046	0.042	0.042	0.038	0.042
0.1	0.3	0.058	0.054	0.057	0.053	0.055	0.057	0.054	0.052	0.046	0.050
0.1	0.4	0.065	0.061	0.064	0.056	0.058	0.074	0.067	0.066	0.053	0.060
0.1	0.5	0.081	0.076	0.077	0.061	0.062	0.100	0.091	0.087	0.064	0.070
0.1	0.6	0.118	0.105	0.106	0.066	0.068	0.149	0.130	0.123	0.075	0.079
0.1	0.7	0.228	0.185	0.183	0.077	0.078	0.266	0.205	0.198	0.082	0.084
0.1	0.8	0.934	0.531	0.489	0.100	0.097	0.873	0.456	0.433	0.084	0.086
0.2	0.2	0.055	0.052	0.055	0.052	0.055	0.058	0.053	0.053	0.047	0.053
0.2	0.3	0.058	0.055	0.058	0.055	0.057	0.075	0.071	0.067	0.061	0.066
0.2	0.4	0.065	0.061	0.064	0.058	0.060	0.103	0.092	0.089	0.072	0.084
0.2	0.5	0.082	0.077	0.078	0.063	0.065	0.154	0.136	0.127	0.094	0.105
0.2	0.6	0.134	0.114	0.115	0.069	0.071	0.275	0.220	0.205	0.120	0.126
0.2	0.7	0.456	0.265	0.259	0.081	0.082	0.898	0.470	0.446	0.142	0.141
0.3	0.3	0.060	0.058	0.059	0.058	0.059	0.104	0.092	0.090	0.076	0.090
0.3	0.4	0.066	0.062	0.064	0.061	0.063	0.156	0.130	0.128	0.097	0.126
0.3	0.5	0.084	0.077	0.078	0.067	0.068	0.279	0.211	0.208	0.140	0.180
0.3	0.6	0.201	0.131	0.134	0.073	0.075	0.908	0.462	0.452	0.202	0.252
0.4	0.4	0.068	0.064	0.067	0.064	0.067	0.280	0.220	0.209	0.152	0.209
0.4	0.5	0.087	0.077	0.078	0.070	0.072	0.913	0.478	0.454	0.268	0.417

SEE GLOSSARY OF COLUMN HEADINGS AT FOOT OF TABLE G1C

Table G2

LOGNORMAL POPULATION — SAMPLES SIZES 50, 100, AND 200

MEANS, VARIANCES, AND COVARIANCES OF ESTIMATES OF PARAMETERS FROM 500 RANDOM SAMPLES, EACH OF SIZE N, WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE, DRAWN FROM LOGNORMAL POPULATION WITH PARAMETERS $\mu=4$, $\sigma=2$, AND $\tau=10$

N	Q1	Q2	MEAN($\hat{\mu}$)	MEAN($\hat{\mu}\|\sigma$)	MEAN($\hat{\mu}\|\tau$)	MEAN($\hat{\mu}\|\sigma,\tau$)
50	0.00	0.0	3.9172	3.9295	3.9899	3.9899
100	0.00	0.0	3.9624	3.9682	4.0009	4.0009
200	0.00	0.0	3.9903	3.9917	4.0080	4.0080
100	0.00	0.5	3.9838	3.9490	3.9608	3.9912
100	0.01	0.0	3.9654	3.9707	4.0011	4.0010
100	0.01	0.5	3.9726	3.9513	3.9602	3.9912

N	Q1	Q2	MEAN($\hat{\sigma}$)	MEAN($\hat{\sigma}\|\mu$)	MEAN($\hat{\sigma}\|\tau$)	MEAN($\hat{\sigma}\|\mu,\tau$)
50	0.00	0.0	2.0758	2.0958	1.9570	1.9774
100	0.00	0.0	2.0450	2.0541	1.9810	1.9913
200	0.00	0.0	2.0129	2.0180	1.9828	1.9881
100	0.00	0.5	2.0943	2.1273	1.9383	1.9709
100	0.01	0.0	2.0330	2.0410	1.9806	1.9911
100	0.01	0.5	2.0613	2.1065	1.9361	1.9697

N	Q1	Q2	MEAN($\hat{\tau}$)	MEAN($\hat{\tau}\|\mu$)	MEAN($\hat{\tau}\|\sigma$)	MEAN($\hat{\tau}\|\mu,\sigma$)
50	0.00	0.0	10.5885	10.6103	10.6109	10.6046
100	0.00	0.0	10.3209	10.3252	10.3160	10.3131
200	0.00	0.0	10.1490	10.1520	10.1501	10.1499
100	0.00	0.5	10.3114	10.3349	10.3197	10.3133
100	0.01	0.0	10.3513	10.3620	10.3582	10.3551
100	0.01	0.5	10.3118	10.3691	10.3653	10.3557

N	Q1	Q2	VAR($\hat{\mu}$)	VAR($\hat{\sigma}$)	VAR($\hat{\tau}$)	COV($\hat{\mu},\hat{\sigma}$)	COV($\hat{\mu},\hat{\tau}$)	COV($\hat{\sigma},\hat{\tau}$)
50	0.00	0.0	0.0860	0.0693	0.6132	-0.0119	-0.0087	0.0663
100	0.00	0.0	0.0416	0.0312	0.1733	-0.0032	-0.0015	0.0232
200	0.00	0.0	0.0211	0.0121	0.0477	-0.0010	-0.0016	0.0072
100	0.00	0.5	0.0600	0.0961	0.2109	0.0296	0.0146	0.0628
100	0.01	0.0	0.0425	0.0314	0.3359	-0.0042	0.0108	0.0380
100	0.01	0.5	0.0591	0.1036	0.5098	0.0279	0.0194	0.1303

N	Q1	Q2	VAR($\hat{\mu}\|\tau$)	VAR($\hat{\sigma}\|\tau$)	COV($\hat{\mu},\hat{\sigma}\|\tau$)	VAR($\hat{\mu}\|\sigma$)	VAR($\hat{\tau}\|\sigma$)	COV($\hat{\mu},\hat{\tau}\|\sigma$)
50	0.00	0.0	0.0798	0.0408	0.0006	0.0837	0.5240	0.0059
100	0.00	0.0	0.0406	0.0218	0.0002	0.0413	0.1536	0.0015
200	0.00	0.0	0.0208	0.0096	-0.0001	0.0211	0.0433	-0.0010
100	0.00	0.5	0.0576	0.0460	0.0198	0.0511	0.1540	-0.0009
100	0.01	0.0	0.0406	0.0224	0.0000	0.0421	0.2831	-0.0048
100	0.01	0.5	0.0574	0.0473	0.0197	0.0516	0.2815	-0.0057

N	Q1	Q2	VAR($\hat{\sigma}\|\mu$)	VAR($\hat{\tau}\|\mu$)	COV($\hat{\sigma},\hat{\tau}\|\mu$)	VAR($\hat{\mu}\|\sigma,\tau$)	VAR($\hat{\sigma}\|\mu,\tau$)	VAR($\hat{\tau}\|\mu,\sigma$)
50	0.00	0.0	0.0692	0.6047	0.0603	0.0798	0.0407	0.5315
100	0.00	0.0	0.0308	0.1725	0.0221	0.0406	0.0216	0.1552
200	0.00	0.0	0.0120	0.0477	0.0069	0.0208	0.0096	0.0436
100	0.00	0.5	0.0789	0.1905	0.0469	0.0492	0.0393	0.1553
100	0.01	0.0	0.0312	0.3299	0.0363	0.0406	0.0222	0.2858
100	0.01	0.5	0.0872	0.4374	0.1011	0.0494	0.0407	0.2858

Table G3

WEIBULL POPULATION — SAMPLE SIZES 50 AND 100

Results of Monte Carlo Study of Estimates of Parameters of Weibull Population with Scale Parameter $\theta = 10$, Shape Parameter $K = 3$, and Location Parameter $c = 20$ from 500 Random Samples of Size N

	N=50	N=100		N=50	N=100		N=50	N=100
$M(\hat{\theta})$	9.92	9.83	$M(\hat{K})$	3.11	3.00	$M(\hat{c})$	20.03	20.11
$M(\hat{\theta}\|K)$	9.76	9.90	$M(\hat{K}\|\theta)$	3.10	3.04	$M(\hat{c}\|\theta)$	20.01	19.99
$M(\hat{\theta}\|c)$	10.01	9.98	$M(\hat{K}\|c)$	3.11	3.03	$M(\hat{c}\|K)$	20.25	20.08
$M(\hat{\theta}\|K,c)$	9.99	9.98	$M(\hat{K}\|\theta,c)$	3.07	3.02	$M(\hat{c}\|\theta,K)$	20.04	19.99
$V(\hat{\theta})$	11.15	3.44	$V(\hat{K}\|\theta)$	0.122	0.051	$V(\hat{\theta}\|c)$	0.241	0.132
$AV(\hat{\theta})$	2.72	1.36	$AV(\hat{K}\|\theta)$	0.103	0.051	$AV(\hat{\theta}\|c)$	0.246	0.123
$V(\hat{K})$	1.69	0.55	$V(\hat{c}\|\theta)$	0.190	0.108	$V(\hat{K}\|c)$	0.123	0.056
$AV(\hat{K})$	0.40	0.20	$AV(\hat{c}\|\theta)$	0.194	0.097	$AV(\hat{K}\|c)$	0.109	0.055
$V(\hat{c})$	9.66	2.99	$C(\hat{K},\hat{c}\|\theta)$	-0.033	-0.014	$C(\hat{\theta},\hat{K}\|c)$	0.045	0.031
$AV(\hat{c})$	2.14	1.07	$AC(\hat{K},\hat{c}\|\theta)$	-0.028	-0.014	$AC(\hat{\theta},\hat{K}\|c)$	0.051	0.026
$C(\hat{\theta},\hat{K})$	4.15	1.30	$V(\hat{\theta}\|K)$	0.787	0.359	$V(\hat{\theta}\|K,c)$	0.218	0.116
$AC(\hat{\theta},\hat{K})$	0.89	0.45	$AV(\hat{\theta}\|K)$	0.704	0.352	$AV(\hat{\theta}\|K,c)$	0.222	0.111
$C(\hat{\theta},\hat{c})$	-10.26	-3.15	$V(\hat{c}\|K)$	0.657	0.328	$V(\hat{K}\|\theta,c)$	0.112	0.049
$AC(\hat{\theta},\hat{c})$	-2.30	-1.15	$AV(\hat{c}\|K)$	0.592	0.296	$AV(\hat{K}\|\theta,c)$	0.099	0.049
$C(\hat{K},\hat{c})$	-3.87	-1.21	$C(\hat{\theta},\hat{c}\|K)$	-0.611	-0.282	$V(\hat{c}\|\theta,K)$	0.181	0.104
$AC(\hat{K},\hat{c})$	-0.78	-0.39	$AC(\hat{\theta},\hat{c}\|K)$	-0.534	-0.267	$AV(\hat{c}\|\theta,K)$	0.187	0.093

M = mean; V = variance; C = covariance; prefix A indicates asymptotic value

Table G4

LOGISTIC POPULATION — SAMPLES SIZES 10 AND 20

A. MEANS, VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATES OF MEAN AND STANDARD DEVIATION OF STANDARD LOGISTIC DISTRIBUTION (μ=0, σ=1) FROM 1000 SAMPLES OF SIZE N=10 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$M(\hat{\mu})$	$M(\hat{\sigma})$	$V(\hat{\mu})$	$C(\hat{\mu},\hat{\sigma})$	$V(\hat{\sigma})$	$M(\hat{\mu}\|\sigma)$	$M(\hat{\sigma}\|\mu)$	$V(\hat{\mu}\|\sigma)$	$V(\hat{\sigma}\|\mu)$
0.0	0.0	0.00	0.94	0.092	-0.001	0.071	0.00	0.99	0.092	0.073
0.0	0.1	-0.00	0.93	0.093	-0.000	0.079	-0.00	0.99	0.092	0.082
0.0	0.2	-0.01	0.92	0.094	0.002	0.085	-0.00	0.99	0.094	0.090
0.0	0.3	-0.02	0.90	0.097	0.008	0.095	-0.00	0.99	0.096	0.101
0.0	0.4	-0.05	0.87	0.105	0.017	0.106	-0.01	0.98	0.102	0.113
0.0	0.5	-0.08	0.84	0.113	0.028	0.121	-0.02	0.98	0.107	0.126
0.0	0.6	-0.14	0.78	0.147	0.056	0.146	-0.04	0.97	0.126	0.142
0.0	0.7	-0.26	0.69	0.231	0.110	0.184	-0.07	0.97	0.163	0.153
0.0	0.8	-0.54	0.52	0.394	0.194	0.224	-0.12	0.97	0.228	0.167
0.1	0.0	0.00	0.93	0.092	-0.002	0.080	0.00	0.99	0.092	0.082
0.1	0.1	-0.00	0.92	0.093	0.000	0.090	0.00	0.98	0.092	0.094
0.1	0.2	-0.01	0.90	0.094	0.003	0.099	-0.00	0.98	0.094	0.105
0.1	0.3	-0.02	0.88	0.097	0.009	0.113	-0.00	0.98	0.096	0.120
0.1	0.4	-0.05	0.84	0.105	0.022	0.126	-0.01	0.97	0.102	0.135
0.1	0.5	-0.09	0.79	0.115	0.034	0.153	-0.02	0.96	0.107	0.157
0.1	0.6	-0.17	0.70	0.153	0.071	0.187	-0.04	0.95	0.126	0.179
0.1	0.7	-0.35	0.52	0.242	0.132	0.221	-0.07	0.94	0.163	0.196
0.2	0.0	0.01	0.91	0.094	-0.006	0.088	0.00	0.99	0.094	0.091
0.2	0.1	0.01	0.90	0.095	-0.005	0.100	0.00	0.98	0.094	0.105
0.2	0.2	0.00	0.88	0.096	-0.001	0.111	0.00	0.98	0.096	0.120
0.2	0.3	-0.01	0.84	0.098	0.005	0.130	-0.00	0.97	0.098	0.142
0.2	0.4	-0.04	0.78	0.106	0.017	0.149	-0.01	0.96	0.104	0.168
0.2	0.5	-0.10	0.70	0.114	0.035	0.189	-0.02	0.94	0.108	0.203
0.2	0.6	-0.22	0.52	0.149	0.068	0.215	-0.04	0.91	0.128	0.241
0.3	0.0	0.03	0.89	0.096	-0.010	0.097	0.01	0.98	0.095	0.101
0.3	0.1	0.02	0.87	0.097	-0.008	0.109	0.01	0.98	0.096	0.116
0.3	0.2	0.02	0.84	0.097	-0.005	0.127	0.00	0.97	0.097	0.140
0.3	0.3	0.00	0.79	0.099	0.001	0.150	0.00	0.96	0.099	0.170
0.3	0.4	-0.03	0.69	0.106	0.016	0.173	-0.01	0.94	0.105	0.210
0.3	0.5	-0.10	0.52	0.114	0.028	0.204	-0.01	0.90	0.110	0.262
0.4	0.0	0.05	0.87	0.100	-0.017	0.114	0.01	0.98	0.098	0.117
0.4	0.1	0.05	0.83	0.100	-0.017	0.133	0.01	0.97	0.098	0.138
0.4	0.2	0.05	0.78	0.101	-0.015	0.159	0.01	0.96	0.099	0.173
0.4	0.3	0.04	0.69	0.102	-0.008	0.193	0.01	0.94	0.102	0.224
0.4	0.4	0.00	0.50	0.108	0.010	0.210	0.00	0.89	0.108	0.299
0.5	0.0	0.08	0.84	0.121	-0.037	0.133	0.02	0.98	0.110	0.131
0.5	0.1	0.09	0.78	0.122	-0.042	0.161	0.02	0.96	0.110	0.160
0.5	0.2	0.10	0.70	0.122	-0.045	0.197	0.02	0.95	0.112	0.208
0.5	0.3	0.10	0.53	0.122	-0.042	0.238	0.02	0.92	0.115	0.292
0.6	0.0	0.15	0.78	0.156	-0.068	0.162	0.04	0.97	0.127	0.143
0.6	0.1	0.18	0.69	0.159	-0.077	0.195	0.04	0.95	0.127	0.178
0.6	0.2	0.22	0.52	0.157	-0.078	0.222	0.04	0.92	0.130	0.234
0.7	0.0	0.27	0.69	0.229	-0.114	0.190	0.07	0.96	0.160	0.152
0.7	0.1	0.36	0.51	0.232	-0.124	0.218	0.07	0.93	0.161	0.193
0.8	0.0	0.53	0.52	0.399	-0.196	0.229	0.11	0.96	0.230	0.163

$M(\hat{\mu})$=MEAN VALUE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ UNKNOWN)
$M(\hat{\sigma})$=MEAN VALUE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ UNKNOWN)
$V(\hat{\mu})$=VARIANCE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ UNKNOWN)
$V(\hat{\sigma})$=VARIANCE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES μ UNKNOWN)
$C(\hat{\mu},\hat{\sigma})$=COVARIANCE OF MLES $\hat{\mu}$ AND $\hat{\sigma}$ IN 1000 SAMPLES
$M(\hat{\mu}|\sigma)$=MEAN VALUE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ KNOWN)
$M(\hat{\sigma}|\mu)$=MEAN VALUE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ KNOWN)
$V(\hat{\mu}|\sigma)$=VARIANCE OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ KNOWN)
$V(\hat{\sigma}|\mu)$=VARIANCE OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ KNOWN)

B. MEANS, VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATES OF MEAN AND STANDARD DEVIATION OF STANDARD LOGISTIC DISTRIBUTION ($\mu=0$, $\sigma=1$) FROM 1000 SAMPLES OF SIZE N=20 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$M(\hat{\mu})$	$M(\hat{\sigma})$	$V(\hat{\mu})$	$C(\hat{\mu},\hat{\sigma})$	$V(\hat{\sigma})$	$M(\hat{\mu}\|\sigma)$	$M(\hat{\sigma}\|\mu)$	$V(\hat{\mu}\|\sigma)$	$V(\hat{\sigma}\|\mu)$
0.0	0.0	0.00	0.97	0.047	-0.001	0.035	0.00	1.00	0.047	0.035
0.0	0.1	0.00	0.96	0.047	-0.001	0.038	0.00	1.00	0.047	0.038
0.0	0.2	-0.00	0.96	0.048	0.001	0.043	0.00	0.99	0.047	0.044
0.0	0.3	-0.01	0.95	0.048	0.004	0.050	0.00	0.99	0.048	0.052
0.0	0.4	-0.02	0.94	0.052	0.009	0.061	-0.00	1.00	0.051	0.061
0.0	0.5	-0.03	0.93	0.060	0.020	0.077	-0.00	1.00	0.055	0.074
0.0	0.6	-0.06	0.90	0.083	0.042	0.097	-0.02	1.00	0.065	0.082
0.0	0.7	-0.12	0.86	0.125	0.078	0.131	-0.03	0.99	0.078	0.088
0.0	0.8	-0.27	0.76	0.243	0.157	0.183	-0.06	0.98	0.111	0.091
0.0	0.9	-0.72	0.53	0.740	0.411	0.323	-0.12	1.00	0.214	0.100
0.1	0.0	0.00	0.97	0.047	-0.002	0.038	0.00	1.00	0.047	0.038
0.1	0.1	0.00	0.96	0.047	-0.001	0.041	0.00	0.99	0.047	0.042
0.1	0.2	-0.00	0.95	0.048	0.000	0.047	-0.00	0.99	0.047	0.049
0.1	0.3	-0.01	0.94	0.048	0.003	0.057	0.00	0.99	0.048	0.059
0.1	0.4	-0.02	0.93	0.052	0.009	0.070	-0.00	1.00	0.051	0.071
0.1	0.5	-0.03	0.91	0.060	0.021	0.091	-0.00	1.00	0.055	0.087
0.1	0.6	-0.08	0.86	0.085	0.047	0.119	-0.02	0.99	0.065	0.100
0.1	0.7	-0.16	0.78	0.134	0.099	0.172	-0.03	0.98	0.078	0.110
0.1	0.8	-0.47	0.50	0.264	0.188	0.232	-0.06	0.97	0.111	0.114
0.2	0.0	0.01	0.96	0.048	-0.003	0.042	0.00	1.00	0.047	0.042
0.2	0.1	0.01	0.95	0.048	-0.004	0.048	0.00	0.99	0.047	0.047
0.2	0.2	0.00	0.94	0.048	-0.001	0.055	0.00	0.99	0.048	0.056
0.2	0.3	-0.00	0.92	0.049	-0.001	0.067	0.00	0.99	0.049	0.069
0.2	0.4	-0.02	0.90	0.052	0.007	0.087	-0.00	0.99	0.051	0.087
0.2	0.5	-0.04	0.87	0.060	0.022	0.115	-0.00	0.99	0.056	0.111
0.2	0.6	-0.10	0.78	0.086	0.057	0.157	-0.02	0.97	0.066	0.133
0.2	0.7	-0.28	0.53	0.143	0.120	0.229	-0.03	0.94	0.079	0.152
0.3	0.0	0.01	0.95	0.049	-0.006	0.049	0.00	0.99	0.048	0.048
0.3	0.1	0.01	0.93	0.049	-0.007	0.057	0.00	0.99	0.048	0.056
0.3	0.2	0.01	0.91	0.049	-0.006	0.066	0.00	0.98	0.049	0.066
0.3	0.3	0.00	0.89	0.049	-0.002	0.082	0.00	0.98	0.049	0.085
0.3	0.4	-0.01	0.85	0.052	0.006	0.113	0.00	0.98	0.052	0.114
0.3	0.5	-0.04	0.77	0.060	0.025	0.162	-0.00	0.97	0.056	0.160
0.3	0.6	-0.16	0.51	0.090	0.072	0.218	-0.01	0.92	0.067	0.218
0.4	0.0	0.03	0.93	0.051	-0.011	0.059	0.01	0.99	0.049	0.056
0.4	0.1	0.03	0.91	0.052	-0.013	0.071	0.01	0.98	0.049	0.067
0.4	0.2	0.03	0.88	0.052	-0.012	0.082	0.01	0.97	0.050	0.081
0.4	0.3	0.02	0.83	0.052	-0.011	0.109	0.01	0.96	0.051	0.113
0.4	0.4	0.01	0.75	0.053	-0.003	0.165	0.01	0.95	0.053	0.173
0.4	0.5	-0.04	0.50	0.060	0.019	0.243	0.00	0.91	0.058	0.292
0.5	0.0	0.04	0.91	0.058	-0.020	0.071	0.01	0.99	0.052	0.064
0.5	0.1	0.05	0.88	0.059	-0.024	0.087	0.01	0.98	0.052	0.078
0.5	0.2	0.06	0.83	0.059	-0.026	0.109	0.01	0.96	0.053	0.101
0.5	0.3	0.06	0.74	0.060	-0.030	0.155	0.01	0.94	0.054	0.153
0.5	0.4	0.06	0.49	0.060	-0.022	0.209	0.01	0.90	0.057	0.264
0.6	0.0	0.07	0.89	0.075	-0.040	0.096	0.02	0.99	0.058	0.075
0.6	0.1	0.09	0.84	0.077	-0.048	0.119	0.02	0.97	0.058	0.093
0.6	0.2	0.11	0.74	0.080	-0.058	0.158	0.02	0.94	0.059	0.127
0.6	0.3	0.17	0.49	0.083	-0.072	0.228	0.02	0.90	0.060	0.219
0.7	0.0	0.12	0.85	0.117	-0.079	0.134	0.03	0.98	0.071	0.083
0.7	0.1	0.18	0.76	0.131	-0.105	0.181	0.03	0.96	0.071	0.104
0.7	0.2	0.31	0.48	0.130	-0.111	0.211	0.03	0.91	0.072	0.141
0.8	0.0	0.24	0.78	0.238	-0.160	0.191	0.05	0.98	0.103	0.086
0.8	0.1	0.45	0.51	0.270	-0.203	0.247	0.05	0.96	0.104	0.107
0.9	0.0	0.73	0.53	0.673	-0.356	0.281	0.13	1.01	0.221	0.103

C. COMPARISON OF MEASURES OF PRECISION OF BEST LINEAR UNBIASED ESTIMATORS AND MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS OF LOGISTIC DISTRIBUTION FROM SAMPLES OF SIZE N=10 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$V(\mu^*)$	$S(\hat{\mu})$	$A(\hat{\mu})$	$S(\hat{\mu}\|\sigma)$	$A(\hat{\mu}\|\sigma)$	$V(\sigma^*)$	$S(\hat{\sigma})$	$A(\hat{\sigma})$	$S(\hat{\sigma}\|\mu)$	$A(\hat{\sigma}\|\mu)$
0.0	0.0	0.093	0.092	0.091	0.092	0.091	0.077	0.075	0.070	0.073	0.070
0.0	0.1	0.094	0.093	0.091	0.092	0.091	0.086	0.084	0.077	0.082	0.077
0.0	0.2	0.095	0.094	0.092	0.094	0.092	0.100	0.092	0.088	0.090	0.088
0.0	0.3	0.099	0.098	0.095	0.096	0.094	0.120	0.105	0.103	0.101	0.102
0.0	0.4	0.109	0.107	0.101	0.102	0.097	0.149	0.123	0.125	0.113	0.120
0.0	0.5	0.132	0.119	0.116	0.107	0.104	0.195	0.147	0.156	0.127	0.140
0.0	0.6	0.189	0.168	0.151	0.127	0.116	0.273	0.194	0.205	0.142	0.157
0.0	0.7	0.358	0.299	0.239	0.167	0.139	0.430	0.278	0.287	0.154	0.167
0.0	0.8	1.102	0.689	0.503	0.243	0.187	0.904	0.458	0.452	0.168	0.168
0.1	0.0	0.094	0.092	0.091	0.092	0.091	0.086	0.085	0.077	0.082	0.077
0.1	0.1	0.094	0.093	0.091	0.092	0.091	0.098	0.097	0.085	0.094	0.085
0.1	0.2	0.095	0.094	0.092	0.094	0.092	0.116	0.109	0.099	0.105	0.099
0.1	0.3	0.099	0.098	0.095	0.096	0.094	0.144	0.128	0.119	0.120	0.117
0.1	0.4	0.109	0.108	0.102	0.102	0.098	0.187	0.152	0.148	0.136	0.142
0.1	0.5	0.136	0.122	0.118	0.107	0.104	0.261	0.197	0.194	0.158	0.171
0.1	0.6	0.213	0.183	0.160	0.127	0.116	0.413	0.278	0.272	0.181	0.197
0.1	0.7	0.535	0.367	0.283	0.168	0.139	0.875	0.451	0.432	0.200	0.213
0.2	0.0	0.095	0.094	0.092	0.094	0.092	0.100	0.096	0.088	0.091	0.088
0.2	0.1	0.095	0.095	0.092	0.094	0.092	0.116	0.110	0.099	0.105	0.099
0.2	0.2	0.096	0.096	0.093	0.096	0.093	0.142	0.126	0.117	0.120	0.117
0.2	0.3	0.099	0.098	0.095	0.098	0.094	0.183	0.155	0.145	0.143	0.144
0.2	0.4	0.109	0.108	0.102	0.104	0.098	0.256	0.197	0.189	0.169	0.183
0.2	0.5	0.141	0.123	0.120	0.109	0.105	0.405	0.280	0.266	0.206	0.234
0.2	0.6	0.274	0.197	0.174	0.129	0.118	0.862	0.447	0.426	0.250	0.287
0.3	0.0	0.099	0.097	0.095	0.095	0.094	0.120	0.108	0.103	0.101	0.102
0.3	0.1	0.099	0.097	0.095	0.096	0.094	0.144	0.125	0.119	0.116	0.117
0.3	0.2	0.099	0.098	0.095	0.097	0.094	0.183	0.153	0.145	0.141	0.144
0.3	0.3	0.101	0.099	0.096	0.099	0.096	0.254	0.195	0.188	0.172	0.188
0.3	0.4	0.109	0.107	0.102	0.105	0.100	0.402	0.270	0.264	0.214	0.260
0.3	0.5	0.149	0.124	0.121	0.110	0.108	0.856	0.431	0.423	0.272	0.376
0.4	0.0	0.109	0.103	0.101	0.098	0.097	0.149	0.132	0.125	0.117	0.120
0.4	0.1	0.109	0.103	0.102	0.098	0.098	0.187	0.161	0.148	0.140	0.142
0.4	0.2	0.109	0.103	0.102	0.099	0.098	0.256	0.206	0.189	0.175	0.183
0.4	0.3	0.109	0.103	0.102	0.102	0.100	0.402	0.288	0.264	0.228	0.260
0.4	0.4	0.112	0.108	0.105	0.108	0.105	0.855	0.457	0.422	0.310	0.422
0.5	0.0	0.132	0.127	0.116	0.111	0.104	0.195	0.160	0.156	0.132	0.140
0.5	0.1	0.136	0.130	0.118	0.111	0.104	0.261	0.208	0.194	0.161	0.171
0.5	0.2	0.141	0.132	0.120	0.112	0.105	0.405	0.287	0.266	0.211	0.234
0.5	0.3	0.149	0.133	0.121	0.115	0.108	0.856	0.462	0.423	0.299	0.376
0.6	0.0	0.189	0.179	0.151	0.128	0.116	0.273	0.212	0.205	0.144	0.157
0.6	0.1	0.213	0.191	0.160	0.129	0.116	0.413	0.294	0.272	0.181	0.197
0.6	0.2	0.274	0.207	0.174	0.131	0.118	0.862	0.455	0.426	0.241	0.287
0.7	0.0	0.358	0.301	0.239	0.164	0.139	0.430	0.288	0.287	0.154	0.167
0.7	0.1	0.535	0.364	0.283	0.165	0.139	0.875	0.461	0.432	0.198	0.213
0.8	0.0	1.102	0.681	0.503	0.243	0.187	0.904	0.456	0.452	0.165	0.168

$V(\mu^*)$=EXACT VARIANCE OF BLUE μ^*
$S(\hat{\mu})$=MEAN SQUARE ERROR OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ UNKNOWN)
$A(\hat{\mu})$=VARIANCE OF MLE $\hat{\mu}$ AS GIVEN BY ASYMPTOTIC FORMULA (σ UNKNOWN)
$S(\hat{\mu}|\sigma)$=MEAN SQUARE ERROR OF MLE $\hat{\mu}$ IN 1000 SAMPLES (σ KNOWN)
$A(\hat{\mu}|\sigma)$=VARIANCE OF MLE μ AS GIVEN BY ASYMPTOTIC FORMULA (σ KNOWN)
$V(\sigma^*)$=EXACT VARIANCE OF BLUE σ^*
$S(\hat{\sigma})$=MEAN SQUARE ERROR OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ UNKNOWN)
$A(\hat{\sigma})$=VARIANCE OF MLE $\hat{\sigma}$ AS GIVEN BY ASYMPTOTIC FORMULA (μ UNKNOWN)
$S(\hat{\sigma}|\mu)$=MEAN SQUARE ERROR OF MLE $\hat{\sigma}$ IN 1000 SAMPLES (μ KNOWN)
$A(\hat{\sigma}|\mu)$=VARIANCE OF MLE $\hat{\sigma}$ AS GIVEN BY ASYMPTOTIC FORMULA (μ KNOWN)

D. COMPARISON OF MEASURES OF PRECISION OF BEST LINEAR UNBIASED ESTIMATORS AND MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS OF LOGISTIC DISTRIBUTION FROM SAMPLES OF SIZE N=20 WITH PROPORTIONS Q1 CENSORED FROM BELOW AND Q2 FROM ABOVE

Q1	Q2	$V(\mu^*)$	$S(\hat{\mu})$	$A(\hat{\mu})$	$S(\hat{\mu}\|\sigma)$	$A(\hat{\mu}\|\sigma)$	$V(\sigma^*)$	$S(\hat{\sigma})$	$A(\hat{\sigma})$	$S(\hat{\sigma}\|\mu)$	$A(\hat{\sigma}\|\mu)$
0.0	0.0	0.046	0.047	0.046	0.047	0.046	0.037	0.035	0.035	0.035	0.035
0.0	0.1	0.046	0.047	0.046	0.047	0.046	0.041	0.039	0.038	0.038	0.038
0.0	0.2	0.047	0.048	0.046	0.047	0.046	0.047	0.045	0.044	0.044	0.044
0.0	0.3	0.048	0.049	0.047	0.048	0.047	0.055	0.053	0.051	0.052	0.051
0.0	0.4	0.052	0.052	0.051	0.051	0.049	0.068	0.064	0.062	0.061	0.060
0.0	0.5	0.062	0.061	0.058	0.055	0.052	0.087	0.082	0.078	0.074	0.070
0.0	0.6	0.084	0.087	0.076	0.066	0.058	0.117	0.107	0.102	0.082	0.079
0.0	0.7	0.143	0.140	0.119	0.079	0.069	0.172	0.151	0.143	0.088	0.083
0.0	0.8	0.351	0.317	0.251	0.115	0.093	0.301	0.242	0.226	0.091	0.084
0.0	0.9	2.052	1.262	0.902	0.229	0.168	0.951	0.547	0.475	0.100	0.089
0.1	0.0	0.046	0.047	0.046	0.047	0.046	0.041	0.039	0.038	0.038	0.038
0.1	0.1	0.046	0.047	0.046	0.047	0.046	0.046	0.043	0.043	0.042	0.043
0.1	0.2	0.047	0.048	0.046	0.047	0.046	0.053	0.050	0.049	0.049	0.049
0.1	0.3	0.048	0.048	0.047	0.048	0.047	0.065	0.060	0.059	0.059	0.059
0.1	0.4	0.053	0.052	0.051	0.051	0.049	0.083	0.075	0.074	0.071	0.071
0.1	0.5	0.063	0.061	0.059	0.055	0.052	0.111	0.099	0.097	0.087	0.085
0.1	0.6	0.091	0.091	0.080	0.066	0.058	0.164	0.138	0.136	0.100	0.099
0.1	0.7	0.184	0.161	0.141	0.079	0.070	0.290	0.222	0.216	0.110	0.106
0.1	0.8	0.822	0.489	0.402	0.115	0.094	0.928	0.478	0.461	0.115	0.107
0.2	0.0	0.047	0.048	0.046	0.047	0.046	0.047	0.044	0.044	0.042	0.044
0.2	0.1	0.047	0.048	0.046	0.047	0.046	0.053	0.050	0.049	0.047	0.049
0.2	0.2	0.047	0.048	0.046	0.048	0.046	0.064	0.059	0.058	0.056	0.058
0.2	0.3	0.048	0.049	0.047	0.049	0.047	0.081	0.073	0.072	0.069	0.072
0.2	0.4	0.053	0.052	0.051	0.051	0.049	0.109	0.097	0.095	0.087	0.092
0.2	0.5	0.064	0.061	0.060	0.056	0.053	0.161	0.133	0.133	0.111	0.117
0.2	0.6	0.104	0.097	0.087	0.067	0.059	0.286	0.208	0.213	0.134	0.143
0.2	0.7	0.371	0.223	0.201	0.080	0.070	0.920	0.454	0.458	0.155	0.160
0.3	0.0	0.048	0.049	0.047	0.048	0.047	0.055	0.052	0.051	0.048	0.051
0.3	0.1	0.048	0.049	0.047	0.048	0.047	0.065	0.062	0.059	0.056	0.059
0.3	0.2	0.048	0.049	0.047	0.049	0.047	0.081	0.074	0.072	0.066	0.072
0.3	0.3	0.049	0.049	0.048	0.049	0.048	0.108	0.095	0.094	0.085	0.094
0.3	0.4	0.053	0.052	0.051	0.052	0.050	0.160	0.135	0.132	0.114	0.130
0.3	0.5	0.066	0.062	0.060	0.056	0.054	0.284	0.213	0.211	0.161	0.188
0.3	0.6	0.158	0.117	0.103	0.067	0.060	0.917	0.461	0.457	0.224	0.268
0.4	0.0	0.052	0.052	0.051	0.049	0.049	0.068	0.063	0.062	0.056	0.060
0.4	0.1	0.053	0.053	0.051	0.049	0.049	0.083	0.079	0.074	0.068	0.071
0.4	0.2	0.053	0.053	0.051	0.050	0.049	0.109	0.098	0.095	0.082	0.092
0.4	0.3	0.053	0.052	0.051	0.051	0.050	0.160	0.137	0.132	0.114	0.130
0.4	0.4	0.054	0.053	0.052	0.053	0.052	0.283	0.228	0.211	0.175	0.211
0.4	0.5	0.069	0.062	0.061	0.058	0.056	0.916	0.494	0.456	0.300	0.422
0.5	0.0	0.062	0.060	0.058	0.053	0.052	0.087	0.079	0.078	0.064	0.070
0.5	0.1	0.063	0.062	0.059	0.053	0.052	0.111	0.101	0.097	0.079	0.085
0.5	0.2	0.064	0.062	0.060	0.053	0.053	0.161	0.138	0.133	0.103	0.117
0.5	0.3	0.066	0.063	0.060	0.054	0.054	0.284	0.221	0.211	0.157	0.188
0.5	0.4	0.069	0.063	0.061	0.057	0.056	0.916	0.466	0.456	0.274	0.422
0.6	0.0	0.084	0.080	0.076	0.058	0.058	0.117	0.108	0.102	0.075	0.079
0.6	0.1	0.091	0.085	0.080	0.059	0.058	0.164	0.144	0.136	0.094	0.099
0.6	0.2	0.104	0.093	0.087	0.059	0.059	0.286	0.225	0.213	0.130	0.143
0.6	0.3	0.158	0.113	0.103	0.061	0.060	0.917	0.488	0.457	0.230	0.268
0.7	0.0	0.143	0.133	0.119	0.071	0.069	0.172	0.156	0.143	0.083	0.083
0.7	0.1	0.184	0.163	0.141	0.072	0.070	0.290	0.241	0.216	0.106	0.106
0.7	0.2	0.371	0.227	0.201	0.073	0.070	0.920	0.485	0.458	0.149	0.160
0.8	0.0	0.351	0.296	0.251	0.106	0.093	0.301	0.239	0.226	0.087	0.084
0.8	0.1	0.822	0.474	0.402	0.106	0.094	0.928	0.483	0.461	0.109	0.107
0.9	0.0	2.052	1.208	0.902	0.239	0.169	0.951	0.505	0.475	0.103	0.089

Table G5

TYPE I EXTREME-VALUE POPULATION — SAMPLE SIZES 10 AND 20

A. MEANS, VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATES OF PARAMETERS OF STANDARD TYPE I ASYMPTOTIC SMALLEST-VALUE DISTRIBUTION (u=0, b=1) FROM 2000 SAMPLES OF SIZE n=10 WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

q_1	q_2	$M(\hat{u})$	$M(\hat{b})$	$V(\hat{u})$	$C(\hat{u},\hat{b})$	$V(\hat{b})$	$M(\hat{u}\|b)$	$M(\hat{b}\|u)$	$V(\hat{u}\|b)$	$V(\hat{b}\|u)$
0.0	0.0	-0.04	0.93	0.112	-0.022	0.058	-0.05	0.98	0.104	0.053
0.0	0.1	-0.05	0.92	0.119	-0.012	0.070	-0.06	0.99	0.116	0.067
0.0	0.2	-0.08	0.90	0.132	0.000	0.084	-0.06	0.99	0.131	0.083
0.0	0.3	-0.11	0.88	0.154	0.017	0.098	-0.08	0.99	0.151	0.097
0.0	0.4	-0.16	0.85	0.200	0.046	0.118	-0.10	0.99	0.182	0.112
0.0	0.5	-0.22	0.82	0.267	0.084	0.140	-0.11	0.99	0.217	0.122
0.0	0.6	-0.34	0.77	0.400	0.153	0.179	-0.14	0.98	0.269	0.131
0.0	0.7	-0.56	0.68	0.685	0.249	0.211	-0.19	0.98	0.392	0.137
0.0	0.8	-1.02	0.53	1.321	0.430	0.264	-0.26	0.99	0.622	0.147
0.1	0.0	-0.04	0.92	0.114	-0.024	0.062	-0.05	0.97	0.104	0.058
0.1	0.1	-0.05	0.90	0.120	-0.015	0.077	-0.06	0.98	0.116	0.074
0.1	0.2	-0.07	0.88	0.132	-0.003	0.094	-0.06	0.98	0.131	0.093
0.1	0.3	-0.11	0.85	0.154	0.017	0.112	-0.08	0.98	0.151	0.112
0.1	0.4	-0.17	0.81	0.201	0.049	0.136	-0.09	0.98	0.182	0.129
0.1	0.5	-0.25	0.77	0.271	0.093	0.164	-0.10	0.98	0.218	0.143
0.1	0.6	-0.41	0.67	0.409	0.171	0.211	-0.13	0.97	0.270	0.156
0.1	0.7	-0.76	0.49	0.688	0.261	0.230	-0.18	0.96	0.393	0.165
0.2	0.0	-0.03	0.91	0.116	-0.027	0.069	-0.05	0.97	0.104	0.063
0.2	0.1	-0.05	0.89	0.121	-0.019	0.086	-0.06	0.98	0.116	0.083
0.2	0.2	-0.07	0.86	0.132	-0.005	0.108	-0.06	0.98	0.132	0.107
0.2	0.3	-0.11	0.82	0.154	0.018	0.132	-0.08	0.98	0.152	0.132
0.2	0.4	-0.18	0.76	0.202	0.055	0.162	-0.10	0.97	0.183	0.156
0.2	0.5	-0.28	0.69	0.277	0.107	0.200	-0.11	0.97	0.218	0.178
0.2	0.6	-0.52	0.51	0.427	0.201	0.258	-0.14	0.95	0.271	0.199
0.3	0.0	-0.02	0.89	0.119	-0.032	0.075	-0.05	0.96	0.105	0.068
0.3	0.1	-0.04	0.86	0.123	-0.024	0.098	-0.06	0.97	0.117	0.093
0.3	0.2	-0.06	0.83	0.133	-0.008	0.123	-0.06	0.97	0.132	0.123
0.3	0.3	-0.11	0.77	0.155	0.016	0.152	-0.08	0.97	0.153	0.157
0.3	0.4	-0.20	0.67	0.202	0.055	0.182	-0.09	0.95	0.184	0.189
0.3	0.5	-0.35	0.52	0.272	0.104	0.206	-0.10	0.94	0.220	0.219
0.4	0.0	-0.00	0.86	0.125	-0.041	0.087	-0.05	0.95	0.106	0.075
0.4	0.1	-0.02	0.83	0.128	-0.034	0.116	-0.05	0.96	0.118	0.108
0.4	0.2	-0.05	0.77	0.137	-0.018	0.149	-0.06	0.96	0.134	0.150
0.4	0.3	-0.10	0.68	0.155	0.009	0.190	-0.07	0.94	0.155	0.206
0.4	0.4	-0.22	0.49	0.200	0.049	0.205	-0.09	0.92	0.187	0.262
0.5	0.0	0.01	0.84	0.136	-0.052	0.102	-0.05	0.95	0.108	0.084
0.5	0.1	0.00	0.79	0.137	-0.047	0.140	-0.05	0.95	0.120	0.128
0.5	0.2	-0.02	0.70	0.143	-0.033	0.191	-0.06	0.95	0.137	0.197
0.5	0.3	-0.08	0.52	0.158	-0.003	0.242	-0.08	0.93	0.158	0.294
0.6	0.0	0.06	0.78	0.151	-0.070	0.121	-0.05	0.93	0.110	0.092
0.6	0.1	0.06	0.69	0.152	-0.068	0.168	-0.05	0.92	0.124	0.147
0.6	0.2	0.05	0.52	0.154	-0.052	0.221	-0.06	0.90	0.141	0.245
0.7	0.0	0.15	0.69	0.185	-0.102	0.151	-0.04	0.90	0.115	0.103
0.7	0.1	0.19	0.51	0.183	-0.103	0.203	-0.04	0.88	0.131	0.178
0.8	0.0	0.34	0.52	0.246	-0.146	0.180	-0.03	0.88	0.127	0.110

$M(\hat{u})$=MEAN VALUE OF MLE $\hat{u}$ IN 2000 SAMPLES (b UNKNOWN)
$M(\hat{b})$=MEAN VALUE OF MLE $\hat{b}$ IN 2000 SAMPLES (u UNKNOWN)
$V(\hat{u})$=VARIANCE OF MLE $\hat{u}$ IN 2000 SAMPLES (b UNKNOWN)
$V(\hat{b})$=VARIANCE OF MLE $\hat{b}$ IN 2000 SAMPLES (u UNKNOWN)
$C(\hat{u},\hat{b})$=COVARIANCE OF MLES $\hat{u}$ AND $\hat{b}$ IN 2000 SAMPLES
$M(\hat{u}|b)$=MEAN VALUE OF MLE $\hat{u}$ IN 2000 SAMPLES (b KNOWN)
$M(\hat{b}|u)$=MEAN VALUE OF MLE $\hat{b}$ IN 2000 SAMPLES (u KNOWN)
$V(\hat{u}|b)$=VARIANCE OF MLE $\hat{u}$ IN 2000 SAMPLES (b KNOWN)
$V(\hat{b}|u)$=VARIANCE OF MLE $\hat{b}$ IN 2000 SAMPLES (u KNOWN)

B. MEANS, VARIANCES AND COVARIANCES OF MAXIMUM-LIKELIHOOD ESTIMATES OF PARAMETERS OF STANDARD TYPE I ASYMPTOTIC SMALLEST-VALUE DISTRIBUTION (u=0, b=1) FROM 2000 SAMPLES OF SIZE n=20 WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

q_1	q_2	$M(\hat{u})$	$M(\hat{b})$	$V(\hat{u})$	$C(\hat{u},\hat{b})$	$V(\hat{b})$	$M(\hat{u}\|b)$	$M(\hat{b}\|u)$	$V(\hat{u}\|b)$	$V(\hat{b}\|u)$
0.0	0.0	-0.02	0.96	0.056	-0.013	0.032	-0.02	0.99	0.050	0.029
0.0	0.1	-0.02	0.96	0.059	-0.007	0.040	-0.02	0.99	0.058	0.038
0.0	0.2	-0.04	0.95	0.065	-0.002	0.047	-0.03	0.99	0.065	0.047
0.0	0.3	-0.05	0.94	0.075	0.007	0.056	-0.03	0.99	0.074	0.055
0.0	0.4	-0.07	0.93	0.094	0.023	0.069	-0.04	1.00	0.087	0.063
0.0	0.5	-0.11	0.91	0.131	0.044	0.081	-0.05	0.99	0.107	0.069
0.0	0.6	-0.16	0.88	0.202	0.083	0.103	-0.06	0.99	0.136	0.073
0.0	0.7	-0.26	0.84	0.358	0.152	0.136	-0.08	0.99	0.186	0.074
0.0	0.8	-0.52	0.76	0.787	0.299	0.187	-0.13	0.99	0.307	0.077
0.0	0.9	-1.39	0.51	1.820	0.519	0.232	-0.27	1.02	0.660	0.095
0.1	0.0	-0.01	0.96	0.056	-0.014	0.034	-0.02	0.99	0.050	0.031
0.1	0.1	-0.02	0.95	0.060	-0.009	0.043	-0.02	0.99	0.058	0.042
0.1	0.2	-0.04	0.94	0.065	-0.002	0.052	-0.03	0.99	0.065	0.053
0.1	0.3	-0.05	0.93	0.075	0.008	0.063	-0.03	0.99	0.074	0.062
0.1	0.4	-0.08	0.91	0.096	0.027	0.080	-0.04	0.99	0.087	0.074
0.1	0.5	-0.12	0.88	0.137	0.054	0.099	-0.05	0.99	0.108	0.081
0.1	0.6	-0.20	0.84	0.219	0.104	0.130	-0.06	0.98	0.136	0.085
0.1	0.7	-0.36	0.76	0.419	0.208	0.185	-0.09	0.98	0.186	0.087
0.1	0.8	-0.92	0.49	0.907	0.374	0.232	-0.13	0.98	0.308	0.092
0.2	0.0	-0.01	0.95	0.058	-0.016	0.038	-0.02	0.98	0.050	0.033
0.2	0.1	-0.02	0.94	0.061	-0.012	0.049	-0.02	0.99	0.058	0.047
0.2	0.2	-0.03	0.93	0.066	-0.005	0.060	-0.03	0.99	0.065	0.061
0.2	0.3	-0.05	0.91	0.075	0.007	0.074	-0.03	0.99	0.075	0.075
0.2	0.4	-0.08	0.88	0.095	0.029	0.099	-0.04	0.99	0.087	0.092
0.2	0.5	-0.14	0.84	0.140	0.064	0.127	-0.05	0.98	0.108	0.104
0.2	0.6	-0.26	0.76	0.238	0.135	0.181	-0.06	0.97	0.136	0.111
0.2	0.7	-0.62	0.51	0.500	0.297	0.278	-0.08	0.96	0.187	0.114
0.3	0.0	-0.01	0.94	0.060	-0.019	0.042	-0.02	0.98	0.051	0.036
0.3	0.1	-0.02	0.93	0.062	-0.015	0.055	-0.02	0.98	0.058	0.052
0.3	0.2	-0.03	0.91	0.066	-0.006	0.071	-0.03	0.98	0.065	0.072
0.3	0.3	-0.05	0.88	0.075	0.007	0.089	-0.03	0.98	0.075	0.092
0.3	0.4	-0.09	0.84	0.096	0.032	0.123	-0.04	0.98	0.088	0.117
0.3	0.5	-0.18	0.75	0.147	0.081	0.171	-0.05	0.96	0.108	0.140
0.3	0.6	-0.43	0.50	0.253	0.164	0.231	-0.06	0.93	0.137	0.150
0.4	0.0	0.00	0.93	0.063	-0.023	0.049	-0.02	0.98	0.051	0.040
0.4	0.1	-0.01	0.91	0.064	-0.020	0.068	-0.02	0.97	0.059	0.062
0.4	0.2	-0.02	0.88	0.068	-0.011	0.090	-0.03	0.97	0.066	0.090
0.4	0.3	-0.05	0.84	0.076	0.003	0.119	-0.03	0.97	0.076	0.124
0.4	0.4	-0.10	0.75	0.096	0.035	0.174	-0.04	0.96	0.089	0.173
0.4	0.5	-0.27	0.50	0.147	0.093	0.232	-0.05	0.91	0.110	0.224
0.5	0.0	0.01	0.92	0.067	-0.028	0.055	-0.02	0.97	0.052	0.043
0.5	0.1	0.00	0.89	0.068	-0.025	0.080	-0.03	0.97	0.059	0.070
0.5	0.2	-0.01	0.84	0.070	-0.019	0.112	-0.03	0.96	0.067	0.110
0.5	0.3	-0.04	0.76	0.076	-0.001	0.160	-0.03	0.96	0.076	0.171
0.5	0.4	-0.12	0.51	0.096	0.036	0.229	-0.04	0.92	0.090	0.278
0.6	0.0	0.03	0.89	0.077	-0.040	0.069	-0.02	0.96	0.053	0.047
0.6	0.1	0.03	0.84	0.077	-0.040	0.105	-0.02	0.95	0.061	0.084
0.6	0.2	0.03	0.75	0.077	-0.037	0.157	-0.03	0.94	0.069	0.147
0.6	0.3	0.01	0.50	0.080	-0.018	0.220	-0.03	0.90	0.079	0.280
0.7	0.0	0.07	0.86	0.098	-0.063	0.093	-0.02	0.95	0.055	0.054
0.7	0.1	0.09	0.76	0.099	-0.073	0.152	-0.02	0.93	0.064	0.102
0.7	0.2	0.14	0.50	0.098	-0.077	0.235	-0.03	0.88	0.073	0.213
0.8	0.0	0.16	0.77	0.150	-0.108	0.132	-0.01	0.94	0.061	0.056
0.8	0.1	0.30	0.50	0.149	-0.124	0.200	-0.02	0.89	0.072	0.111
0.9	0.0	0.49	0.51	0.289	-0.199	0.189	-0.00	0.94	0.079	0.059

C. COMPARISON OF MEASURES OF PRECISION OF BEST LINEAR UNBIASED, BEST LINEAR INVARIANT, AND MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS OF TYPE I ASYMPTOTIC DISTRIBUTION OF SMALLEST VALUES FROM SAMPLES OF SIZE $n=10$ WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

q_1	q_2	$V(u^*)$	$S(\tilde{u})$	$S(\hat{u})$	$A(\hat{u})$	$S(\hat{u}\|b)$	$A(\hat{u}\|b)$	$V(b^*)$	$S(\tilde{b})$	$S(\hat{b})$	$A(\hat{b})$	$S(\hat{b}\|u)$	$A(\hat{b}\|u)$
0.0	0.0	0.113	0.113	0.114	0.111	0.107	0.100	0.072	0.067	0.063	0.061	0.054	0.055
0.0	0.1	0.120	0.120	0.122	0.115	0.119	0.111	0.088	0.081	0.077	0.077	0.068	0.074
0.0	0.2	0.134	0.134	0.137	0.125	0.135	0.125	0.107	0.097	0.094	0.093	0.083	0.093
0.0	0.3	0.162	0.161	0.166	0.145	0.157	0.143	0.132	0.117	0.113	0.112	0.097	0.111
0.0	0.4	0.214	0.210	0.226	0.181	0.191	0.167	0.166	0.142	0.141	0.137	0.112	0.126
0.0	0.5	0.321	0.303	0.315	0.251	0.229	0.200	0.215	0.177	0.172	0.172	0.122	0.137
0.0	0.6	0.559	0.496	0.515	0.393	0.288	0.250	0.298	0.229	0.233	0.222	0.131	0.141
0.0	0.7	1.204	0.949	0.999	0.719	0.426	0.333	0.461	0.315	0.313	0.307	0.137	0.142
0.0	0.8	3.904	2.317	2.354	1.648	0.691	0.500	0.949	0.487	0.488	0.474	0.147	0.144
0.1	0.0			0.115	0.112	0.107	0.100			0.069	0.065	0.058	0.059
0.1	0.1			0.122	0.116	0.119	0.111			0.086	0.084	0.075	0.081
0.1	0.2			0.138	0.125	0.135	0.125			0.108	0.104	0.093	0.104
0.1	0.3			0.167	0.145	0.157	0.143			0.134	0.129	0.112	0.127
0.1	0.4			0.231	0.183	0.191	0.167			0.172	0.163	0.130	0.148
0.1	0.5			0.332	0.262	0.229	0.200			0.219	0.212	0.144	0.162
0.1	0.6			0.578	0.437	0.288	0.250			0.318	0.295	0.157	0.169
0.1	0.7			1.269	0.903	0.427	0.333			0.485	0.460	0.167	0.170
0.2	0.0			0.117	0.114	0.107	0.100			0.077	0.072	0.064	0.063
0.2	0.1			0.123	0.117	0.120	0.111			0.099	0.095	0.083	0.091
0.2	0.2			0.138	0.126	0.136	0.125			0.127	0.121	0.108	0.120
0.2	0.3			0.167	0.145	0.158	0.143			0.163	0.155	0.133	0.153
0.2	0.4			0.236	0.186	0.192	0.167			0.218	0.205	0.157	0.184
0.2	0.5			0.355	0.278	0.229	0.200			0.296	0.287	0.179	0.207
0.2	0.6			0.700	0.520	0.289	0.251			0.494	0.452	0.202	0.218
0.3	0.0			0.119	0.117	0.107	0.100			0.087	0.081	0.069	0.070
0.3	0.1			0.124	0.119	0.120	0.112			0.116	0.111	0.094	0.104
0.3	0.2			0.138	0.127	0.136	0.125			0.153	0.146	0.124	0.145
0.3	0.3			0.167	0.145	0.159	0.144			0.205	0.196	0.158	0.194
0.3	0.4			0.241	0.189	0.193	0.168			0.290	0.279	0.191	0.248
0.3	0.5			0.394	0.307	0.231	0.201			0.439	0.444	0.223	0.291
0.4	0.0			0.125	0.123	0.108	0.101			0.105	0.094	0.078	0.077
0.4	0.1			0.129	0.124	0.121	0.112			0.146	0.135	0.110	0.122
0.4	0.2			0.139	0.129	0.138	0.126			0.201	0.186	0.152	0.182
0.4	0.3			0.166	0.145	0.160	0.145			0.294	0.270	0.209	0.269
0.4	0.4			0.248	0.192	0.196	0.169			0.468	0.435	0.269	0.383
0.5	0.0			0.136	0.134	0.110	0.102			0.127	0.113	0.087	0.086
0.5	0.1			0.137	0.134	0.123	0.114			0.186	0.172	0.131	0.146
0.5	0.2			0.143	0.136	0.141	0.128			0.282	0.258	0.200	0.242
0.5	0.3			0.165	0.147	0.163	0.147			0.470	0.424	0.299	0.424
0.6	0.0			0.155	0.155	0.112	0.104			0.168	0.143	0.098	0.097
0.6	0.1			0.156	0.157	0.126	0.116			0.262	0.239	0.154	0.177
0.6	0.2			0.156	0.157	0.145	0.132			0.453	0.408	0.255	0.343
0.7	0.0			0.207	0.199	0.117	0.109			0.245	0.195	0.112	0.106
0.7	0.1			0.219	0.218	0.133	0.122			0.440	0.380	0.192	0.213
0.8	0.0			0.361	0.317	0.129	0.118			0.414	0.302	0.124	0.112

$V(u^*)$ = EXACT VARIANCE OF BLUE u^*, $S(\tilde{u})$ = MEAN SQUARE ERROR OF BLIE $\tilde{u}$
$S(\hat{u})$ = MEAN SQUARE ERROR OF MLE $\hat{u}$ IN 2000 SAMPLES (b UNKNOWN)
$A(\hat{u})$ = VARIANCE OF MLE $\hat{u}$ AS GIVEN BY ASYMPTOTIC FORMULA (b UNKNOWN)
$S(\hat{u}|b)$ = MEAN SQUARE ERROR OF MLE $\hat{u}$ IN 2000 SAMPLES (b KNOWN)
$A(\hat{u}|b)$ = VARIANCE OF MLE $\hat{u}$ AS GIVEN BY ASYMPTOTIC FORMULA (b KNOWN)
$V(b^*)$ = EXACT VARIANCE OF BLUE b^*, $S(\tilde{b})$ = MEAN SQUARE ERROR OF BLIE $\tilde{b}$
$S(\hat{b})$ = MEAN SQUARE ERROR OF MLE $\hat{b}$ IN 2000 SAMPLES (u UNKNOWN)
$A(\hat{b})$ = VARIANCE OF MLE $\hat{b}$ AS GIVEN BY ASYMPTOTIC FORMULA (u UNKNOWN)
$S(\hat{b}|u)$ = MEAN SQUARE ERROR OF MLE $\hat{b}$ IN 2000 SAMPLES (u KNOWN)
$A(\hat{b}|u)$ = VARIANCE OF MLE $\hat{b}$ AS GIVEN BY ASYMPTOTIC FORMULA (u KNOWN)

D. COMPARISON OF MEASURES OF PRECISION OF BEST LINEAR UNBIASED, BEST LINEAR INVARIANT, AND MAXIMUM-LIKELIHOOD ESTIMATORS OF PARAMETERS OF TYPE I ASYMPTOTIC DISTRIBUTION OF SMALLEST VALUES FROM SAMPLES OF SIZE $n=20$ WITH PROPORTIONS q_1 CENSORED FROM BELOW AND q_2 FROM ABOVE

q_1	q_2	$V(u^*)$	$S(\tilde{u})$	$S(\hat{u})$	$A(\hat{u})$	$S(\hat{u}\|b)$	$A(\hat{u}\|b)$	$V(b^*)$	$S(\tilde{b})$	$S(\hat{b})$	$A(\hat{b})$	$S(\hat{b}\|u)$	$A(\hat{b}\|u)$
0.0	0.0	0.056	0.056	0.056	0.055	0.051	0.050	0.033	0.032	0.033	0.030	0.029	0.027
0.0	0.1	0.059	0.059	0.060	0.058	0.058	0.056	0.041	0.039	0.042	0.038	0.038	0.037
0.0	0.2	0.065	0.065	0.066	0.063	0.066	0.062	0.050	0.047	0.050	0.046	0.047	0.046
0.0	0.3	0.076	0.076	0.078	0.072	0.075	0.071	0.061	0.057	0.060	0.056	0.055	0.055
0.0	0.4	0.098	0.097	0.099	0.091	0.088	0.083	0.075	0.070	0.074	0.069	0.063	0.063
0.0	0.5	0.141	0.138	0.143	0.126	0.110	0.100	0.096	0.087	0.090	0.086	0.069	0.068
0.0	0.6	0.232	0.221	0.228	0.197	0.139	0.125	0.127	0.113	0.117	0.111	0.073	0.071
0.0	0.7	0.456	0.413	0.428	0.360	0.193	0.167	0.184	0.155	0.160	0.153	0.074	0.071
0.0	0.8	1.197	0.978	1.055	0.824	0.324	0.250	0.316	0.240	0.247	0.237	0.077	0.072
0.0	0.9	7.033	3.880	3.749	3.026	0.731	0.500	0.975	0.494	0.471	0.487	0.096	0.081
0.1	0.0			0.056	0.056	0.051	0.050			0.036	0.033	0.031	0.029
0.1	0.1			0.060	0.058	0.058	0.056			0.046	0.042	0.042	0.040
0.1	0.2			0.066	0.065	0.066	0.063			0.056	0.052	0.053	0.052
0.1	0.3			0.078	0.072	0.075	0.071			0.068	0.064	0.062	0.063
0.1	0.4			0.101	0.092	0.088	0.083			0.089	0.081	0.074	0.074
0.1	0.5			0.151	0.131	0.110	0.100			0.113	0.106	0.081	0.081
0.1	0.6			0.257	0.218	0.139	0.125			0.156	0.148	0.086	0.084
0.1	0.7			0.549	0.451	0.193	0.167			0.245	0.230	0.088	0.085
0.1	0.8			1.751	1.388	0.325	0.250			0.490	0.478	0.093	0.086
0.2	0.0			0.058	0.057	0.051	0.050			0.040	0.036	0.033	0.032
0.2	0.1			0.061	0.058	0.059	0.056			0.052	0.048	0.047	0.045
0.2	0.2			0.067	0.063	0.066	0.063			0.065	0.060	0.061	0.060
0.2	0.3			0.078	0.072	0.076	0.072			0.082	0.077	0.075	0.076
0.2	0.4			0.102	0.093	0.089	0.083			0.112	0.102	0.092	0.092
0.2	0.5			0.159	0.139	0.111	0.100			0.153	0.144	0.105	0.103
0.2	0.6			0.303	0.260	0.140	0.125			0.241	0.226	0.112	0.109
0.2	0.7			0.885	0.723	0.194	0.167			0.520	0.474	0.115	0.110
0.3	0.0			0.060	0.059	0.051	0.050			0.045	0.041	0.036	0.035
0.3	0.1			0.062	0.060	0.059	0.056			0.060	0.056	0.053	0.052
0.3	0.2			0.067	0.063	0.066	0.063			0.079	0.073	0.072	0.072
0.3	0.3			0.078	0.072	0.076	0.072			0.103	0.098	0.092	0.097
0.3	0.4			0.104	0.094	0.089	0.084			0.148	0.140	0.118	0.124
0.3	0.5			0.178	0.153	0.111	0.101			0.234	0.222	0.142	0.146
0.3	0.6			0.438	0.378	0.141	0.126			0.484	0.471	0.155	0.157
0.4	0.0			0.063	0.062	0.051	0.050			0.053	0.047	0.040	0.039
0.4	0.1			0.064	0.062	0.059	0.056			0.076	0.067	0.063	0.061
0.4	0.2			0.068	0.065	0.067	0.063			0.104	0.093	0.091	0.091
0.4	0.3			0.078	0.073	0.077	0.072			0.145	0.135	0.125	0.134
0.4	0.4			0.106	0.096	0.090	0.085			0.234	0.218	0.174	0.191
0.4	0.5			0.221	0.191	0.113	0.102			0.487	0.467	0.232	0.249
0.5	0.0			0.067	0.067	0.052	0.051			0.061	0.057	0.043	0.043
0.5	0.1			0.068	0.067	0.060	0.057			0.092	0.086	0.071	0.073
0.5	0.2			0.070	0.068	0.068	0.064			0.138	0.129	0.111	0.121
0.5	0.3			0.077	0.073	0.077	0.073			0.220	0.212	0.173	0.212
0.5	0.4			0.111	0.099	0.091	0.086			0.466	0.461	0.284	0.400
0.6	0.0			0.078	0.077	0.053	0.052			0.080	0.072	0.049	0.048
0.6	0.1			0.078	0.078	0.061	0.058			0.130	0.119	0.086	0.089
0.6	0.2			0.078	0.078	0.069	0.066			0.219	0.204	0.151	0.171
0.6	0.3			0.080	0.079	0.080	0.076			0.474	0.454	0.289	0.435
0.7	0.0			0.103	0.100	0.055	0.054			0.114	0.097	0.056	0.053
0.7	0.1			0.108	0.109	0.065	0.061			0.209	0.190	0.107	0.106
0.7	0.2			0.118	0.122	0.073	0.069			0.483	0.442	0.227	0.252
0.8	0.0			0.177	0.159	0.061	0.059			0.185	0.151	0.060	0.056
0.8	0.1			0.236	0.234	0.073	0.067			0.451	0.418	0.123	0.120
0.9	0.0			0.531	0.409	0.079	0.073			0.430	0.319	0.063	0.057

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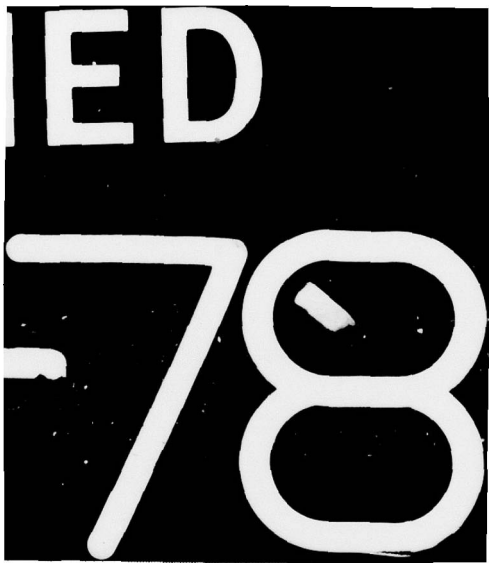
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